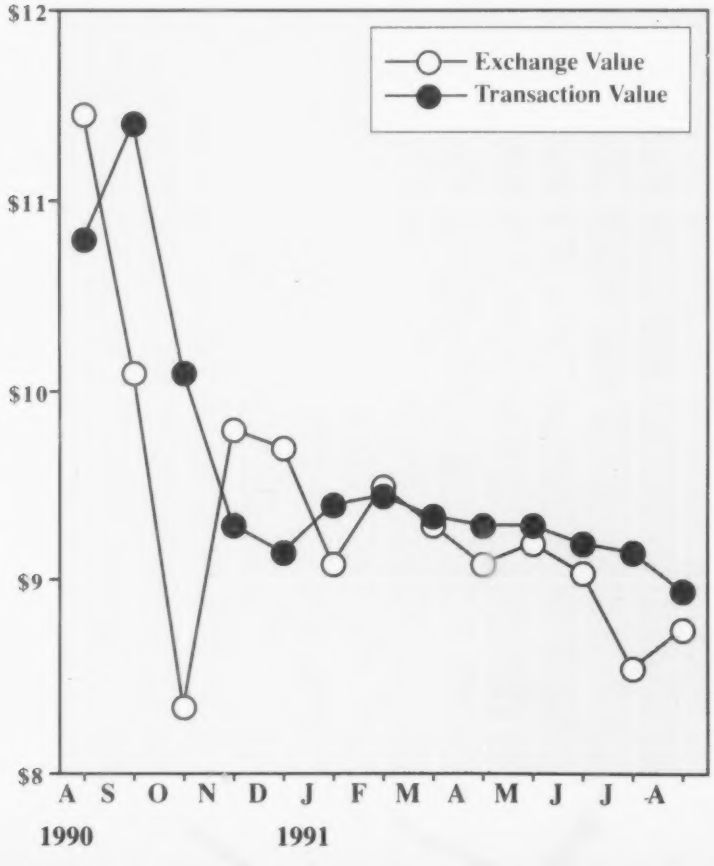
NUEXCO

Monthly Report

September 1991 Number 277

Inventories: A Broader Perspective 16

Uranium Deposits of Brazil 22



NUEXCO

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To Our Readers

NUEXCO will be hosting a hospitality suite at the US Council for Energy Awareness International Uranium Seminar to be held September 22-25 in St. Petersburg, Florida. We look forward to seeing you there.

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Market Values Summary

NUEXCO Market Values	This Report August 31, 1991	Last Report July 31, 1991	12 Months Ago August 31, 1990
EXCHANGE VALUE[1]	**$8.75** /lb equivalent U_3O_8	$8.55	$11.45
UF_6 VALUE[2]	**$26.25** /kg U as UF_6	$25.75	$32.25
LOAN RATE[3]	**3.5%** /annum	3.5%	3.5%
CONVERSION VALUE[4]	**$1.60** /lb U as UF_6	$1.50	$1.45
SWU VALUE[5] **(0.3 % tails assay)**	**$67** /SWU	$66	$50
TRANSACTION VALUE[6]	**$8.95** /lb equivalent U_3O_8	$9.15	$10.80
Transactions	**26**	21	27
Months	**3**	3	3
Millions of Pounds	**5.9**	4.1	5.5

DEFINITIONS

1 The **Exchange Value** is NUEXCO's judgment of the price at which transactions for significant quantities of natural uranium concentrates could be concluded as of the date indicated.

2 The **UF_6 Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of natural uranium hexafluoride could be concluded as of the date indicated.

3 The **Loan Value** is NUEXCO's judgment of the annual interest rate at which uranium loans could be concluded as of the date indicated.

4 The **Conversion Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of conversion services could be concluded in the secondary market as of the date indicated.

5 The **SWU Value** is NUEXCO's judgment of the price at which spot and near-term transactions for significant quantities of enrichment services could be concluded as of the date indicated.

6 The **Transaction Value** is a weighted average price of recent natural uranium sales transactions. The calculation is based on prices paid in:

a) Transactions closed within the previous three month period for which delivery is scheduled within one year of the transaction date;

b) At least ten transactions;

c) Transactions involving a sum total of at least 2 million pounds equivalent U_3O_8.

DERIVATIONS AND COMMENTS

- All **Market Values** are expressed in terms of US$.
- All **Market Values** are based on:
  - Data from recently completed transactions.
  - Data from pending transactions.
  - Firm bids to buy or borrow, and firm offers to sell or lend.
  - Prices purchasers or rates borrowers have expressed a willingness to pay, but for which NUEXCO is not aware of firm bids to buy or borrow and prices sellers or rates lenders have expressed a willingness to accept, but for which NUEXCO is not aware of firm offers to sell or lend.
- Prices associated with deliveries under old or renegotiated contracts or other than arm's-length transactions are not included in the determination of these **Market Values**.
- In the determination of prices, NUEXCO does not consider charges for transportation other than that customarily provided by suppliers.
- The prices of services or materials delivered under long-term contracts with primary suppliers are not considered in the determination of the listed values.
- For the **SWU Value**, NUEXCO converts SWU prices at varying tails and product assays to equivalent SWU prices at a tails assay of 0.30 weight percent U^{235} and a product assay of 3.0 weight-percent U^{235}, assuming feed costs corresponding to the NUEXCO **Exchange Value** and **Conversion Value** determined as of the same date.
- In calculating the **Transaction Value**, NUEXCO does not account for the price of uranium delivered in connection with contracts which call for "market price" mechanisms. This exclusion applies particularly to contracts in which delivery prices are expressed as a function of future **Exchange Values** or any other indeterminate variable. Also excluded from the calculation are any other transactions in which the delivery price is defined in such a way that it can not currently be determined.
- The sample time for the **Transaction Value** is extended as necessary to satisfy the minima for the number of transactions and quantity of material. Other currencies are converted to US dollars using conversion rates in effect on or near the transaction date.

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AUGUST MARKET REVIEW

(as of August 31, 1991)

OVERVIEW

Uranium prices at the end of August were slightly higher than at the end of July, having increased during the middle of the month and then declined slightly by month end. The Exchange Value increased $0.20, to $8.75 per pound U_3O_8, while the UF_6 Value increased $0.50, to $26.25 per kgU as UF_6. The emergence of discretionary demand led to the price rise during the middle of the month; abundant supply, reduced demand, and the realization by market participants of the minimal effects of the coup attempt in the Soviet Union caused subsequent price softening later in August.

Unusual for this time of year, the market was quite active in August, with near-term uranium volume exceeding 2.8 million pounds equivalent U_3O_8 in 13 transactions (**Table 1**), and long-term volume reaching almost ten million pounds in nine transactions.

The conversion market strengthened and the Conversion Value increased $0.10 to $1.60 per pound U as UF_6, with at least two utilities evaluating near-term offers, and two long-term transactions reported. The Loan Rate remained unchanged at 3.5 percent per annum. One loan was reported for a moderate quantity of concentrates.

Table 1
NEAR-TERM URANIUM SALES SUMMARY

	August 1991		Year-to-Date	
	No. of Sales	Volume	No. of Sales	Volume[1]
Concentrates	10	2.2	51	11.0
Natural UF_6	3	0.6	17	5.2
EUP	0	0.0	8	1.5
Total[2]	**13**	**2.8**	**76**	**17.7**

[1] Million pounds equivalent U_3O_8
[2] Due to independent rounding, columns may not equal total.

The enrichment market saw firmer prices during August, as the SWU Value rose one dollar to $67 per SWU. This is a modest increase compared to the significant price rise of the past few months, and could suggest a stabilizing of the SWU market. Four near-term transactions totalling almost 750 thousand SWU and four long-term sales for almost 700 thousand SWU were reported during August.

NATURAL URANIUM AND CONVERSION

The August 31, 1991 **Exchange Value** rose $0.20 to **$8.75** per pound U_3O_8. Low uranium prices early in the month enticed numerous discretionary buyers, including several producers, into the market. This discretionary demand caused prices to approach the $9.00 per pound level temporarily. Although this price rise coincided with the coup attempt in the Soviet Union, the effect of those events on the market proved to be minimal. By month end, the market had calmed and prices settled back to levels closer to the August 31 Exchange Value. The uranium market is once again characterized by several aggressive sellers and limited demand, as it was at the first of the month.

Ten near-term concentrates transactions totalling over 2.2 million pounds equivalent U_3O_8 were reported. Sellers were predominately intermediaries, while all ten buyers were North American, including five utilities, four producers, and one intermediary.

* * *

The **UF_6 Value** climbed $0.50 to **$26.25** per kgU as UF_6. While supply of UF_6 is not as abundant as that of concentrates, demand for UF_6 is very low. Although the slight strengthening of the UF_6 market follows that of the concentrates market, UF_6 now is selling at a discount of $0.14 compared to the sum of the values of its components—concentrates and conversion.

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Three natural UF_6 transactions were reported from August: US and European buyers purchased almost 600 thousand pounds equivalent U_3O_8 from US intermediaries. No enriched uranium product sales were reported.

* * *

The long-term uranium market was quite active in August: eight utilities and one intermediary purchased nearly 10 million pounds equivalent U_3O_8 for delivery during the period 1991-2000. This exceptionally high level of long-term activity occurred independently of the recent events in the Soviet Union, as most buyers had selected their suppliers before those events unfolded. The effects of the political developments on the long-term market are not yet evident. As a result of the failed takeover attempt by Communist hard-liners, the Soviet reform movement gained new strength, and is furthering the move toward a market-based economy. In the long run, these democratic reforms are likely to improve the economic stability of the Soviet Union, and thereby enhance the stability of the global uranium market.

* * *

The **Transaction Value** dropped $0.20 to **$8.95** per pound U_3O_8 based on 26 transactions over three months involving 5.9 million pounds equivalent U_3O_8. August's high volume and lower prices were the primary contributor to the decline.

* * *

Active uranium supply increased by 600 thousand pounds, to **6.6** million pounds equivalent U_3O_8. **Active uranium demand** ended the month at levels up approximately 350 thousand pounds, at **1.2** million pounds equivalent U_3O_8. Although discretionary demand surged early in the month, it was filled as it entered the market, thus reducing overall demand to lower levels by month end. The **supply/demand ratio** dropped from 7.1 to **5.5**.

The **Loan Rate** remained unchanged at **3.5** percent per annum. One loan was reported in which an intermediary borrowed a moderate quantity of concentrates from a producer.

* * *

The conversion market strengthened during August, and the **Conversion Value** rose $0.10 to **$1.60** per pound U as UF_6. This is the first change in the Conversion Value in three months. The apparent lack of UF_6 held by parties other than primary suppliers has caused a gradual strengthening of this market. No near-term conversion transactions were reported, although at least two utilities were evaluating offers at month end at levels near the August 31 Conversion Value. Two long-term conversion sales were reported in August: primary converters sold over 3.5 million pounds U as UF_6 to US utilities for delivery during the period 1992-1996.

Table 2
NEAR-TERM SUPPLY/DEMAND SUMMARY

	Active Supply[1]	Active Demand[1]
• Uranium (thousand lbs equivalent U_3O_8)	6,630	1,213
• Supply/Demand Ratio:	5.5	
• Loan (thousand lbs equivalent U_3O_8)	4,290	0
• Conversion (thousand lbs U as UF_6)	2,350	1,020
• SWU (thousand SWUs)	300	570

[1] Supply and Demand tables in the Market Review section of this Report provide details for each category.

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MARKET REVIEW

ENRICHMENT SERVICES

The SWU market began to stabilize after several months of significant prices increases; the **SWU Value** rose one dollar to **$67** per SWU. The near- and long-term SWU markets remain very distinct, although each displayed notable activity during the month.

Four near-term enrichment sales were reported, as both US and European utilities purchased a total of nearly 750 thousand SWU. Activity in the near-term SWU market remains sporadic, as much of the the near-term demand consists of discretionary buyers seeking small quantities of SWU.

The most consistent demand for SWU occurs in the long-term market. At least 11 utilities continued to evaluate offers at month end for up to 10.7 million SWU for delivery through 2002. This is in addition to the four long-term sales reported in August, in which utilities purchased almost 700 thousand SWU from primary producers for delivery during 1995-1998.

Table 3
ENRICHMENT PRICES
(August 31, 1991)

Prices	This Month Report 277	Last Month Report 276	12 Months Ago Report 265
NUEXCO SWU Value ($US per SWU)	67	66	50
US DOE SWU prices: ($US per SWU)			
USEC	117.85[1]	117.85[1]	117.85[1]
AFC	153.00[2]	153.00[2]	153.00[2]
Requirements	157.00[2]	157.00[2]	157.00[2]
Incentive Price (IP2)[3]	100.68[3]	100.68[3]	90.00[4]
Calculated worth of enriched UF_6[5]: ($US per KgU as UF_6)			
2.0 % U^{235}	223	218	222
2.5 % U^{235}	311	305	304
3.0 % U^{235}	403	395	389
3.5 % U^{235}	496	486	475
4.0 % U^{235}	591	579	562
4.5 % U^{235}	687	673	650

[1] Effective 10/1/89 to 9/30/91.
[2] Effective since 10/1/84.
[3] IP2: Effective 10/1/90 to 9/30/91, for up to 30% of annual requirements.
[4] Used Incentive Price IP1 – effective 10/1/86 to 9/30/90, for up to 30% of annual requirements.
[5] Calculated using the NUEXCO Exchange Value, Conversion Value, SWU Value and 0.30 % U^{235} tails assay.

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RECENT TRANSACTIONS

Uranium Sales [1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds equivalent U_3O_8)	Price Within Percentage Range [2] of Current Exchange or UF_6 Value	Buyer	Seller	Remarks
5188	1991-1995	1,001-3,000	R	Intermediary	Producer	UF_6
5189	1991	50-101	90-97	Utility	Intermediary	
5190	1992	301-600	98-102	Intermediary	Intermediary	UF_6
5191	1992-1996	601-1,000	R	Utility	Producer	
5194	1992	101-300	90-97	Intermediary	Intermediary	UF_6
5196	1991	50-100	98-102	Producer	Intermediary	
5197	1991	50-100	90-97	Producer	Intermediary	
5198	1991	101-300	90-97	Utility	Intermediary	
5201	1991	101-300	98-102	Utility	Intermediary	
5202	1991	101-300	98-102	Utility	Intermediary	
5203	1991	301-600	103-110	Producer	Intermediary	
5204	1992	101-300	103-110	Utility	Intermediary	UF_6
5205	1991	101-300	98-102	Intermediary	Producer	
5209	1991	101-300	98-102	Utility	Intermediary	
5211	1991	301-600	103-110	Producer	R	
5213	1992-1996	300-600	R	Utility	R	
5214	1992-1996	300-600	See Remarks	Utility	R	Price Related to Market
5216	1993-1997	1,001-3,000	See Remarks	Utility	Intermediary	UF_6, Base Escalated
5217	1993-1997	1,001-3,000	See Remarks	Utility	R	Price Related to Market
5221	1992-2000	1,001-3,000	See Remarks	Utility	Producer	Price Related to Market
5222	1992-1995	301-600	See Remarks	Utility	Intermediary	Price Related to Market
5223	1992-1995	301-600	See Remarks	Utility	Intermediary	Series of Fixed Prices

R means that NUEXCO either does not know, or that NUEXCO has restricted that information to protect client or source confidentiality.

[1] Transactions listed are not limited to those in which NUEXCO was involved, but also include others of which NUEXCO is aware. NUEXCO may delay reporting some transactions in order to protect proprietary information.

[2] The ranges *Below 90, 90-97, 98-102, 103-110, Above 110*, represent percentages (rounded to whole numbers) of the appropriate current Exchange Value or UF_6 Value. The endpoints of each range are included within that range.

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RECENT TRANSACTIONS

Natural Uranium Loans [1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds equivalent U_3O_8)	Price Within Percentage Range [2] of Current Loan Rate	Borrower	Lender	Remarks
5206	1991	301-600	Above 110	Intermediary	Producer	

Conversion Sales [1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity (thousand pounds of U equivalent)	Price Within Percentage Range [2] of Current Conversion Value	Buyer	Seller	Remarks
5219	1992-1996	1,001-3,000	R	Utility	Convertor	
5220	1992-1996	1,001-3,000	R	Utility	Convertor	

Enrichment Sales [1]

NUEXCO Transaction Number	Delivery Period	Approximate Quantity [3] (thousand SWU)	Price Within Percentage Range [2] of Current SWU Value [4]	Buyer	Seller	Remarks
5186	1991	301-600	R	R	Producer	
5187	1995	301-600	R	Utility	Producer	
5199	1992	50-100	98-102	Utility	Intermediary	
5207	1997	50-100	R	Utility	Producer	
5208	1996-1998	101-300	R	Utility	Producer	
5210	1992	Less than 50	98-102	Utility	Intermediary	
5212	1995-1998	50-100	R	Utility	Producer	
5218	1992	101-300	90-97	Utility	Intermediary	

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[2] The ranges *Below 90, 90-97, 98-102, 103-110, Above 110*, represent percentages (rounded to whole numbers) of the appropriate current Market Value. The endpoints of each range are included within that range.

[3] If tails assay is unknown or unspecified, NUEXCO's calculation of SWU quantity assumes 0.30 w/o tails assay.

[4] Prices are usually normalized to 0.30 w/o tails assay. When prices and SWU values are expressed as discounts from a reference price (e.g., X dollars less than DOE's USEC base price at time of delivery), the percentage price range is based on the discounted prices, not on the reference price.

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SUPPLY AND DEMAND

Uranium Supply

NUEXCO Project Number	Quantity * (Thousand Pounds equivalent U_3O_8) Spot or Near-term [1]	Intermediate or Long-term [2]	Delivery Period	Remarks
AVAILABLE FOR SALE:				
ACTIVE				
90-1227	500	—	1991	
90-1231	500	500 per year	1991-1995	
91-1502	500	—	1991	
91-1503A	1,330	2,670	1991-1993	UF_6e
91-1505	1,500	—	1991	
91-1506	500	—	1991	
91-1507	500	—	1991	
91-1510*	1,300	—	1991	UF_6
TOTAL	**6,630**			
INACTIVE	**6,030**			
AVAILABLE TO LOAN:				
ACTIVE				
91-1084	3,900	—		U_3O_8
91-1151	390	—		U_3O_8
TOTAL	**4,290**			
INACTIVE	**655**			

* New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: 89-1054A
Active Projects removed since last month: 91-1060, 91-1132, 91-1146, 91-1157, 91-1175, 91-1181

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MARKET REVIEW

SUPPLY AND DEMAND

Uranium Demand

NUEXCO Project Number	Quantity (Thousand Pounds equivalent U_3O_8) Spot or Near-term[1]	Intermediate or Long-term[2]	Delivery Period	Remarks
INQUIRIES TO PURCHASE:				
ACTIVE				
91-1183	25	—	1991	
91-1186	340	—	1991	
91-1188A*	705	—	1992	UF_6e
91-1201*	100	—	1991	
91-1204*	3	—	1991	UF_6
91-1208A*	20	—	1992	UF_6e
91-1213*	20	—	1992	UF_6
91-1118	—	300 per year	1993-1998	U_3O_8/UF_6
91-1184	—	350 per year	1993-1997	
91-1209*	—	100 per year	1991-1995	U_3O_8/UF_6
91-1141*	—	2,680	1992-1995	U_3O_8
91-1197*	—	2,210	1992-1997	U_3O_8/UF_6
TOTAL	**1,213**			
INACTIVE	**1,305**			
INQUIRIES TO BORROW:	*No inquiries to borrow are reported*			

*New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes material deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: 91-1010A, 91-1165
Active Projects removed since last month: 90-1291, 91-1064, 91-1182

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SUPPLY AND DEMAND

Conversion Supply And Demand

NUEXCO Project Number	Quantity (Thousand Pounds U as UF6) Within 3 Years [1]	Beyond 3 Years [1]	Delivery Period	Remarks
AVAILABLE FOR SALE:				
ACTIVE				
91-1202*	1,650	—	1991	
91-1500	300	—	1991	
91-1501	400	—	1991	
TOTAL	**2,350**			
INACTIVE	*None reported*			
INQUIRIES TO PURCHASE:				
ACTIVE				
91-1174	660	—	1991-1992	
91-1185	360	—	1991	
91-1170	—	1,100	1992-1996	
TOTAL	**1,020**			
INACTIVE	*None reported*			

* New or revised since last month.

[1] Measured from the date of this Report.

Active Projects reclassified as Inactive since last month: *none*
Active Projects removed since last month: *none*

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MARKET REVIEW

SUPPLY AND DEMAND

SWU Supply And Demand

NUEXCO Project Number	Quantity (Thousand SWUs) Spot or Near-term [1]	Intermediate or Long-term [2]	Delivery Period	Remarks
AVAILABLE FOR SALE:				
ACTIVE				
91-1508	100	—	1991	
91-1509	200	—	1992	
90-1500	—	1,000 per year	1991 on	
TOTAL	**300**			
INACTIVE	**1,335**			
INQUIRIES TO PURCHASE:				
ACTIVE				
91-1188B*	145	—	1992	UF6e
91-1206*	5	—	1992	UF6e
91-1208B*	2	—	1992	UF6e
91-1210*	400	—	1991-1992	
91-1211*	18	—	1992	
90-1196	—	60 per year	1995 on	
90-1301	—	1,000 per year	1995-2000	UF6e
91-1027	—	55 per year	1996-2000	
91-1094B	—	385 per year	1994-1995	UF6e
91-1105	—	40 per year	1996-2001	
91-1142	—	75 per year	1995-2000	
91-1199*	—	385 per year	1996-2000	
90-1144	—	240	1995-2000	
90-1224B*	—	2,320	1995-2002	UF6e
91-1066	—	320	1995-2000	
91-1131	—	3,660	1995-2001	
91-1136	—	120	1996-2000	
91-1152	—	2,700	1995-2001	
91-1154	—	285	1996-2001	
91-1155	—	450	1996-1999	
91-1160	—	980	1992-1997	
91-1171	—	560	1995-1998	
91-1179	—	245	1992-1994	
TOTAL	**570**			
INACTIVE	**415**			

* New or revised since last month.

[1] For delivery within one year, measured from the date of this Report. This category excludes SWU deliverable within one year under other than spot or near-term contracts.

[2] For delivery beyond one year, measured from the date of this Report.

Active Projects reclassified as Inactive since last month: 89-1054B, 91-1010B, 91-1150
Active Projects removed since last month: 91-1014B, 91-1063

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MARKET VALUES EXPRESSED IN SELECTED CURRENCIES

Exchange Value[1]

Country (currency)	per lb equivalent U_3O_8 as Concentrates			per kg U as Concentrates		
	This Month (Aug. 31, 1991)	Last Month (July 31, 1991)	12 Months Ago (Aug. 31, 1990)	This Month (Aug. 31, 1991)	Last Month (July 31, 1991)	12 Months Ago (Aug. 31, 1990)
Australia (dollar)	11.15	10.98	13.98	29.00	28.53	36.35
Belgium (franc)	314.52	307.00	368.29	817.69	798.14	957.46
Canada (dollar)	9.99	9.84	13.13	25.97	25.58	34.14
EC (ecu)	7.42	7.28	8.68	19.30	18.92	22.56
Finland (markka)	37.11	35.89	42.22	96.47	93.30	109.77
France (franc)	51.90	50.68	60.12	134.93	131.75	156.29
Germany (mark)	15.29	14.90	17.94	39.74	38.75	46.63
Italy (lira)	11,404	11,124	13,294	29,647	28,920	34,561
Japan (yen)	1,197	1,175	1,652	3,112	3,054	4,294
Netherlands (guilder)	17.21	16.80	20.21	44.75	43.69	52.54
So. Africa (comm. rand)	25.14	24.49	29.32	65.37	63.67	76.23
So. Korea (won)	6,407	6,255	8,193	16,657	16,263	21,299
Spain (peseta)	951.29	933.20	1,118	2,473	2,426	2,907
Sweden (krona)	55.45	54.08	65.96	144.16	140.60	171.47
Switzerland (franc)	13.33	13.02	14.83	34.65	33.85	38.56
Taiwan (dollar)	231.18	227.51	308.01	601.01	591.49	800.76
UK (pound)	5.21	5.07	5.97	13.54	13.18	15.52
US (dollar)	8.75	8.55	11.45	22.75	22.23	29.77

Transaction Value[1]

Country (currency)	per lb equivalent U_3O_8 as Concentrates			per kg U as Concentrates		
	This Month (Aug. 31, 1991)	Last Month (July 31, 1991)	12 Months Ago (Aug. 31, 1990)	This Month (Aug. 31, 1991)	Last Month (July 31, 1991)	12 Months Ago (Aug. 31, 1990)
Australia (dollar)	11.41	11.75	13.19	29.66	30.54	34.28
Belgium (franc)	321.71	328.55	347.38	836.38	854.15	903.11
Canada (dollar)	10.22	10.53	12.39	26.56	27.38	32.21
EC (ecu)	7.59	7.79	8.18	19.74	20.24	21.28
Finland (markka)	37.96	38.41	39.82	98.68	99.85	103.53
France (franc)	53.09	54.23	56.70	138.02	140.99	147.42
Germany (mark)	15.64	15.95	16.92	40.65	41.46	43.98
Italy (lira)	11,664	11,905	12,539	30,325	30,950	32,599
Japan (yen)	1,224	1,257	1,558	3,183	3,268	4,050
Netherlands (guilder)	17.61	17.98	19.06	45.78	46.75	49.55
So. Africa (comm. rand)	25.72	26.21	27.66	66.86	68.14	71.90
So. Korea (won)	6,553	6,694	6,404	17,037	17,404	16,649
Spain (peseta)	973.04	998.69	1,055	2,530	2,596	2,742
Sweden (krona)	56.72	57.87	62.21	147.45	150.46	161.74
Switzerland (franc)	13.63	13.94	13.99	35.44	36.23	36.37
Taiwan (dollar)	236.46	243.48	240.76	614.74	633.00	625.92
UK (pound)	5.33	5.43	5.63	13.85	14.10	14.64
US (dollar)	8.95	9.15	10.80	23.27	23.79	28.08

[1] As of May 1991 Report #273; calculated using currency exchange rates for the last business day of the month, as published in *The Wall Street Journal*. Prior to May 1991 Report #273; calculated using currency exchange rates published in *The Wall Street Journal* on the last business day of the month.

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MARKET REVIEW

MARKET VALUES EXPRESSED IN SELECTED CURRENCIES

Conversion Value[1]

Country (currency)	per lb U as UF_6			per kg U as UF_6		
	This Month (Aug. 31, 1991)	Last Month (July 31, 1991)	12 Months Ago (Aug. 31, 1990)	This Month (Aug. 31, 1991)	Last Month (July 31, 1991)	12 Months Ago (Aug. 31, 1990)
Australia (dollar)	2.04	1.93	1.77	4.50	4.25	3.90
Belgium (franc)	57.51	53.86	46.64	126.79	118.74	102.82
Canada (dollar)	1.83	1.73	1.66	4.03	3.81	3.67
EC (ecu)	1.36	1.28	1.10	2.99	2.81	2.42
Finland (markka)	6.79	6.30	5.35	14.96	13.88	11.79
France (franc)	9.49	8.89	7.61	20.92	19.60	16.78
Germany (mark)	2.80	2.61	2.27	6.16	5.76	5.01
Italy (lira)	2,085	1,952	1,684	4,597	4,303	3,711
Japan (yen)	215.88	206.07	209.17	482.54	454.31	461.15
Netherlands (guilder)	3.15	2.95	2.56	6.94	6.50	5.64
So. Africa (comm. rand)	4.60	4.30	3.71	10.14	9.47	8.19
So. Korea (won)	1,172	1,097	1,037	2,583	2,419	2,287
Spain (peseta)	173.95	163.72	141.59	383.50	360.94	312.15
Sweden (krona)	10.14	9.49	8.35	22.35	20.92	18.41
Switzerland (franc)	2.44	2.28	1.88	5.37	5.04	4.14
Taiwan (dollar)	42.27	39.91	39.01	93.19	88.00	85.99
UK (pound)	0.95	0.89	0.76	2.10	1.96	1.67
US (dollar)	1.60	1.50	1.45	3.53	3.31	3.20

SWU Value And UF_6 Value[1]

Country (currency)	SWU Value at 0.30 % Tails Assay			UF_6 Value per kg U as UF_6		
	This Month (Aug. 31, 1991)	Last Month (July 31, 1991)	12 Months Ago (Aug. 31, 1990)	This Month (Aug. 31, 1991)	Last Month (July 31, 1991)	12 Months Ago (Aug. 31, 1990)
Australia (dollar)	85.40	84.72	61.05	33.46	33.06	39.38
Belgium (franc)	2,408	2,370	1,608	943.57	924.60	1,037
Canada (dollar)	76.49	75.97	57.35	29.97	29.64	36.99
EC (ecu)	56.85	56.17	37.89	22.27	21.91	24.44
Finland (markka)	284.14	277.03	184.37	111.32	108.08	118.92
France (franc)	397.41	391.18	262.52	155.70	152.62	169.33
Germany (mark)	117.05	115.04	78.32	45.86	44.88	50.52
Italy (lira)	87,319	85,870	58,052	34,211	33,502	37,443
Japan (yen)	9,166	9,067	7,213	3,591	3,538	4,652
Netherlands (guilder)	131.81	129.72	88.25	51.64	50.61	56.92
So. Africa (comm. rand)	192.53	189.06	128.04	75.43	73.76	82.59
So. Korea (won)	49,059	48,288	35,776	19,221	18,840	23,075
Spain (peseta)	7,284	7,204	4,882	2,854	2,811	3,149
Sweden (krona)	424.59	417.46	288.02	166.35	162.87	185.77
Switzerland (franc)	102.04	100.52	64.78	39.98	39.22	41.78
Taiwan (dollar)	1,770	1,756	1,345	693.53	685.20	867.54
UK (pound)	39.88	39.13	26.07	15.63	15.27	16.81
US (dollar)	67.00	66.00	50.00	26.25	25.75	32.25

[1] As of May 1991 Report #273: calculated using currency exchange rates for the last business day of the month, as published in *The Wall Street Journal*. Prior to May 1991 Report #273: calculated using currency exchange rates published in *The Wall Street Journal* on the last business day of the month.

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WASHINGTON FOCUS

by Linda L. Gunter

While official action ceased as most US government employees took summer vacation, several documents of interest to the nuclear fuel industry were issued in Washington during August. In the House of Representatives, the Energy & Power subcommittee staff released a draft uranium enrichment restructuring bill. A General Accounting Office (GAO) report on AVLIS also was published. When Congress returns in September, the Senate has scheduled a hearing on the status of the AVLIS program, and the House Energy & Commerce Committee may hold a hearing about uranium enrichment.

House Staff Draft Enrichment Legislation

The staff of the Energy & Power Subcommittee released for comment new legislation for the restructuring of DOE's enrichment enterprise. The bill proposes DOE keep the gas diffusion plants (GDPs) and the revenue from current contracts, but creates a government corporation responsible for deploying AVLIS and for funding decommissioning and decontamination (D&D) of the GDPs. The D&D fund is expected to collect $500 million per year from both military and civilian customers.

The committee staff clearly intends this draft to be a discussion paper, since much of the organizational structure and operation of the proposed new corporation is not described in detail. Final legislation will come after comments are received from all interested parties. The significant elements of this bill are described below.

The draft legislation authorizes the corporation to sell stock, as well as to enter joint ventures and equity participation agreements. Initially, the US Treasury will purchase $364 million of the corporation's stock to create a working capital fund. Although it is not stated explicitly, the bill's authors may intend that the Treasury continue to retire the unrecovered government costs of at least $3 billion, as is current practice under the DOE-GAO agreement. To satisfy its debt obligations, the corporation will use proceeds from the public sale of stock, net revenue from the operation or sale of the GDPs, and dividends that it would pay on the stock purchased by the Treasury.

The bill states that DOE cannot compete with the AVLIS corporation and requires DOE to purchase SWU from the corporation if it is asked to do so. The corporation is authorized to "acquire or distribute enriched uranium, feed material for uranium enrichment or depleted uranium." Although the staff summary indicates the GDPs will be permitted to operate more "flexibly", there is no language in the bill that expressly authorizes DOE to do so. DOE is to be reimbursed for any future R&D on AVLIS.

The corporation's borrowing authority is not defined, but rather, set at "an amount not exceeding the amount of its capital stock plus retained earnings to assist in financing its activities and to refinance its bonds." These bonds are not guaranteed by the US Government.

The $500 million per year D&D fund does not include D&D money for any AVLIS facilities. Half the D&D fund will come from annual appropriations for the military portion; the other half is raised from the following formula:

- First, from royalties paid for AVLIS.
- Second, from the net proceeds of the sale of the corporation stock.
- Third, from a fee on electricity generated by nuclear power units.

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If the amount from royalties and the sale of stock is not expected to average $250 million over the expected life of the fund, then the utilities are assessed a fee. Deposits continue until DOE certifies to Congress that the fund has enough money to complete D&D of the gaseous diffusion enrichment facilities. Since the total amount necessary to complete D&D of the three plants has not yet been determined, there is concern on behalf of the utilities that creation of this large revenue stream to the Treasury leaves them vulnerable to funding unspecified clean-up of federal facilities. Furthermore, the utilities are concerned that they will not receive cheaper enrichment prices from AVLIS because the formula yields uncompetitive prices.

GAO Report On AVLIS

In early August, the General Accounting Office released a report entitled "DOE Needs Alternative AVLIS Deployment Options", which should provide Congress with justification to continue government funding for the AVLIS R&D program. The report recommends that DOE revise its current deployment plan, since the original schedule, released in January 1990, set a deadline of October 1992 for a deployment decision, a date that is now unrealistic. According to GAO's findings, there are certain technical problems, such as building and maintaining plant-scale lasers and separators, as well as integrating AVLIS into the fuel cycle, that will not be resolved in time for DOE to make its scheduled deployment decision. GAO also notes that the NRC review of AVLIS will take longer than DOE anticipated and will delay the program further. In addition, GAO said an "updated and expanded analysis of the enrichment market is necessary in order to determine the advantages of building an AVLIS plant in a market that already has overcapacity." The report notes that the fate of AVLIS is tied to legislation pending in Congress restructuring DOE's enrichment program. The report calls for DOE to identify other options for AVLIS deployment if the legislation fails, including creating private sector access under the National Competitiveness Technology Transfer Act of 1989. The report also asks DOE to consider alternative methods for encouraging private sector participation in the demonstration program.

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INDUSTRY BRIEFS

India Announces Plans to Increase Nuclear Fuel Production Capability

India's Department of Atomic Energy announced it plans to invest over seven billion rupees ($270 million) in the next decade to build and expand its nuclear fuel production capability. Plans include increasing the UO_2 pellet production capacity at its Hyderabad uranium oxide fuel plant from 350 MT per year to 660 MT per year; building a uranium fuel assembly plant, also at Hyderabad; and commissioning a 150 MT-per-year zircaloy fabrication plant. The department also is planning to build a 300 MT-per-year zirconium sponge plant near Palayakayal in Tamil Nadu state.

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Scottish Nuclear to Advise Bulgarian Nuclear Group

Scottish Nuclear Ltd. (SNL) has reached an agreement with the Bulgarian nuclear design and construction group, Energoproject, to provide technical assistance to the group. SNL will supply specialists to advise Energoproject on improving the operation, maintenance, efficiency, and safety of Bulgaria's nuclear reactors. This agreement is in addition to the $13 million assistance program for the Kozloduy station from some western European countries being coordinated by the World Association of Nuclear Operators.

Two Nuclear Reactors Return to Service

On August 21, the 340-MWe (net) Obrigheim reactor in Germany reached full power after being shut down since May 1990. Kernkraftwerk Obrigheim's PWR was forced to shut down due to a legal challenge to its operating license. In June 1991, a federal court overruled a lower court decision and allowed the reactor to restart, stating that the reactor's two partial operating licenses and eight regulatory appendices provided a legal basis for its continued operation.

In the USA, Tennessee Valley Authority's (TVA) Browns Ferry Unit 2 reached full power in mid-August after several months of testing. The 1,065-MWe BWR had been shut down since March 1985 due to safety concerns at all three Browns Ferry units. Since that time, TVA has spent over $1.2 billion for improvements at the site to address safety concerns.

BAG Has No Interest in Share of EdF Plant

Contrary to a previous EdF announcement, the German utility Bayernwerk AG (BAG) has stated that it has no interest in owning a share of Electricité de France's (EdF) Civaux 1 reactor as compensation for Edf's share in the power and distribution system in eastern Germany. BAG does not consider a share of a single reactor enough compensation, despite an earlier EdF announcement that a tentative agreement had been reached. Discussions are ongoing among EdF, BAG, PreussenElektra AG, and RWE Energie AG regarding ownership of eastern Germany's power system.

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Rio Algom-URI Merger Delayed

The announced merger between Rio Algom Mining Corporation and Uranium Resources, Inc. has met an unexpected snag that could postpone the conclusion of the deal. Both sides are still supportive of the merger, but a Canadian tax issue could make the transaction prohibitively expensive for Rio Algom. There are hopes to resolve the issue within the next few weeks.

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SPEECH

INVENTORIES: A BROADER PERSPECTIVE

The following is a paper by Earl E. Hoellen, President of NUEXCO, and Treva E. Klingbiel, Vice-President of NUEXCO Information Services. It was presented by Mr. Hoellen at the Uranium Institute Sixteenth Annual Symposium in London, United Kingdom on September 5, 1991.

INTRODUCTION

During the past ten years, the world uranium industry has undergone a major restructuring. Since 1980, nuclear fuel market participants have noted that a return to a balanced market was dependent on the liquidation of inventories to the point where demand for new production would emerge.

Prior to 1980, many countries accumulated large inventories, both in anticipation of aggressive nuclear power programs and to support military needs. In fact, until 1985 the Western World uranium industry was producing U_3O_8 much faster than it was being consumed by nuclear power plants. However, many nuclear power programs were scaled back or phased out entirely, thus eliminating the need for huge strategic stockpiles. Yet inventories continued to accumulate. **Figure 1** illustrates this buildup of inventory. (These figures represent commercially available inventory only, and exclude government stockpiles.)

During most of the 1970s, the US government was the Western World's only supplier of commercial enrichment services. US DOE, not a risk-taking commercial entity, positioned itself to pass on to the ultimate consumers the cost of leading the Western World in the peaceful use of nuclear power. Thus, US DOE's contracts were a fixed-commitment type that were not readily adjustable by the customer to reflect variations in nuclear power plant operating or construction schedules. Consequently, most uranium supply contracts signed in that period reflected this same lack of flexibility, and as the number of nuclear plant deferrals and cancellations grew, so too did utility-held inventories.

Figure 1
Uranium Inventory Buildup • 1970-1990

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In recent years, with demand far below expectations, with mounting carrying costs, and with many of the concerns over adequacy of supply eliminated due to increasingly international uranium trade, perceptions of the minimum acceptable inventory level have also declined. As a result, inventory holders have reassessed their positions. Economic prudence has dictated a reduction in inventory levels and many inventory holders have chosen to sell or lend their inventories on the spot market, while others have cut back on production or purchases and drawn down their stockpiles.

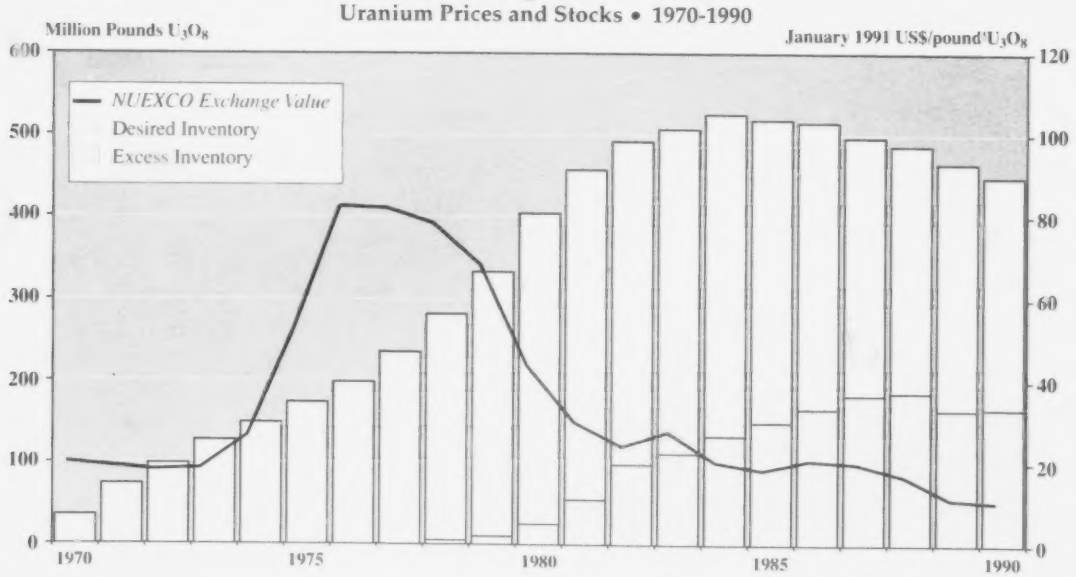
For example, the US DOE, which held over 100 million pounds U_3O_8 (exclusive of defense needs) in 1988, plans to draw down its stockpile to a level of 50 million pounds U_3O_8 primarily through the process of overfeeding at its enrichment facilities. In Italy, large inventories had accumulated in expectation of an aggressive nuclear program that never materialized. The sale of these inventories started several years ago and is only now coming to a close. Germany, which built up a large inventory of uranium to offset a trade imbalance with the US, has been systematically liquidating its inventory since 1989. In almost all cases, these inventory sales have been made at prevailing market prices without consideration for the original production cost or purchase price.

PRICE, POLITICS AND INVENTORY POLICY

This buildup and subsequent liquidation of excess inventory has resulted in a restructuring of the world uranium production industry in ways not anticipated even a few years ago. Whether inventory holders choose to sell, lend, or draw down their stockpiles, the end result is reduced requirements for new production. In fact, annual Western World production has fallen from an all-time high level of about 115 million pounds U_3O_8 in 1980, to 76 million pounds in 1990. Early indications are that 1991 production will be even lower, totalling some 67 million pounds. The accumulation and availability of excess inventories clearly has had a depressing effect on price, as shown in **Figure 2**. Such a relationship between available inventories and price is common in other mineral commodities and is not surprising. Falling prices suggest plentiful supply, which in turn, tends to preclude any perceived need for large inventories.

However, some level of inventory is desired by market participants to mitigate the effects of any supply shortfalls due to accidents, regulatory requirements, labor strikes, or political disruptions; and many entities have inventory

Figure 2
Uranium Prices and Stocks • 1970-1990



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policies which take these factors into account. Such planning is wise, for we all recognize that government intervention in international trade, including the trading of uranium, is commonplace. Examples include the US/Canada Free Trade Agreement, the US Comprehensive Anti-Apartheid Act of 1986, and the Australian Labor Party's Three Mine Policy.

The political realities of laws, sanctions, embargoes, floor prices, and production controls introduce a significant element of additional uncertainty when establishing nuclear fuel inventory policies. The anticipation of possible political intervention can itself become a destabilizing factor in the market, particularly when inflamed by erroneous or suggestive articles or reports. With the political changes in Eastern Europe and the entrance into the market place of China and the Soviet Union, the difficulty of evaluating the political factor and its impact on inventory policy is at an all-time high. This difficulty further complicates the analysis of the world inventory situation.

Until recently, any analysis of the impact of inventories on the market confined itself to inventories held by commercial entities, since government stockpiles were regarded as strategic and highly unlikely ever to enter the marketplace. This assumption was most openly invalidated in 1989 when the German government decided to begin the sale of its stockpile of US origin enriched uranium. With the easing of tensions among the world's superpowers, more governments can be expected to examine the possibility of releasing at least some of their stockpiles into the market and, if done, such inventories will be sold at prices unrelated to their "sunk costs".

A realignment of our thinking is now necessary: analysis of the inventory situation can no longer be confined to the World Outside Centrally Planned Economic Areas (Western World) but must be broadened to include Eastern Europe and China. Not only must we expand our geographical boundaries, but any analysis must now also take into account non-traditional market participants.

CENTRALLY PLANNED ECONOMIES

The cessation of the production of weapons-grade uranium by China and the Soviet Union has led to substantial excess nuclear fuel cycle capacity in both countries. In China, although current goals call for nuclear generating capacity of 6,000 MWe by the year 2000, none of the three units under construction are yet operating. The lack of any existing domestic requirement and the halt of enriched uranium production for military purposes means that China's entire fuel cycle capability is now available for commercial use, if it chooses to make it available. In the Soviet Union, just as in the Western World, the rate of nuclear power growth has not met original expectations. That country's 1985 plan to have 200,000 MWe in operation by 2000 was recently revised to a more realistic 50,000-80,000 MWe by 2005. This, coupled with the cessation of production of all highly enriched weapons-grade uranium in 1987, has led to substantial excess nuclear fuel cycle capacity in the Soviet Union.

Between 1946 and 1990, the Soviet Union's former east European satellites of Bulgaria, Czechoslovakia, East Germany, and Hungary produced nearly one billion pounds U_3O_8 equivalent. The Soviet Union produced approximately 500 million pounds during the same period. Essentially all of the satellites' production was produced under contract to the Soviet Union and was shipped there in return for an eventual supply of fabricated nuclear fuel. As of January 1991, however, the Soviet Union no longer controls the uranium operations of its former satellites, and has not renewed uranium trade agreements with these countries.

The combined east European supply of 1.5 billion pounds U_3O_8 equivalent fell into one of three categories:

- Military use for weapons and fuel.
- Civilian use as a nuclear fuel in both the Soviet Union and its satellites.
- Strategic inventory for fulfillment of possible future requirements (both civilian and military).

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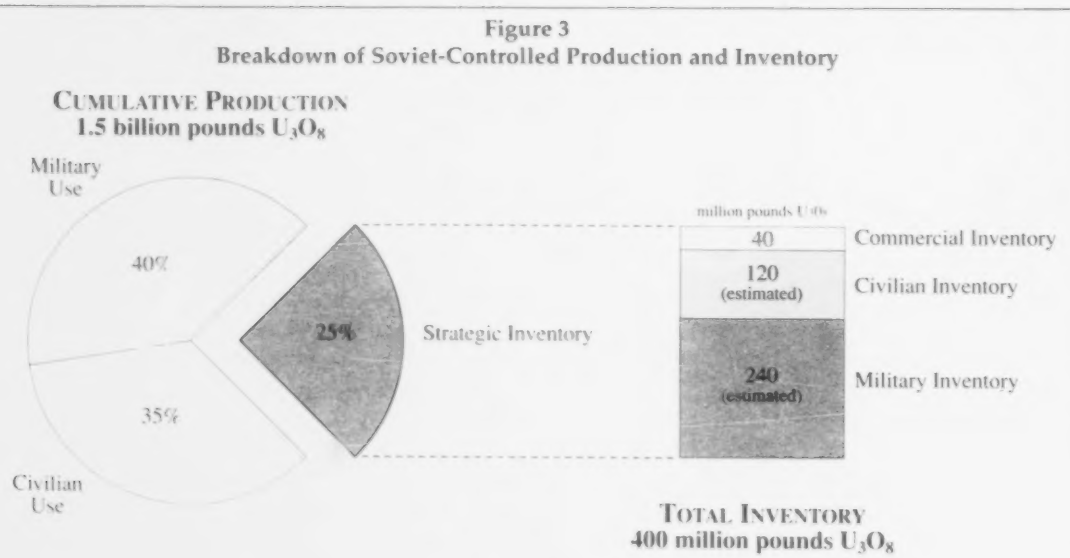
Although detailed figures have not been published by the Soviets, NUEXCO's best estimate is that these three categories account for approximately 40 percent, 35 percent, and 25 percent, respectively, of the total combined supply. Thus, we estimate that some 400 million pounds U_3O_8 equivalent exist in the current Soviet strategic inventory. As shown in **Figure 3**, most of this inventory is believed to be strategic military inventory in the form of highly enriched uranium and is probably not presently available for commercial use. It is estimated that the amount of commercial inventory which could be made available for sale is approximately 15,000 MTU in U_3O_8 (approximately 40 million pounds). The balance of Soviet strategic inventory is viewed as a reserve for domestic power production, and includes some U_3O_8 as well as reprocessed uranium, plutonium, and tails. It is believed that there is no low-enriched uranium inventory except for normal working stock at the enrichment plants.

The Soviet uranium industry, as it exists today, consists chiefly of a series of regional uranium processing facilities that receive ores and concentrates from outlying mines. NUEXCO-affiliated personnel have visited many of these regional facilities that are designed to process other metal ores in addition to uranium, or to produce uranium as a by- or co-product to some other primary product. These "metallurgical complexes", as they are called, are centers of both administration and production, employ a large number of people, and are equivalent to the "company towns" that were common in the US prior to WWII. Regardless of the overall political situation, it is reasonable to assume that the government plans to keep these complexes operating to provide continued employment for the workforce. Independence of various republics within the Soviet Union could increase the pressure for continued production and employment. Ultimately, the market economy that the Soviets are so desperately seeking to establish will set the level of such continued production.

NUEXCO estimates that China has produced a total of approximately 300 million pounds U_3O_8 and is currently producing at about 50 percent of its capability, which is believed to be in the range of 10 million pounds U_3O_8 per year. China has an aggressive plan for building future reactors, but with no reactors having yet reached commercial operation, China has indicated that it can make available for annual export about 3 million pounds equivalent U_3O_8 of its production.

Figure 3
Breakdown of Soviet-Controlled Production and Inventory



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In addition, up until the late 1980s, China has pursued an aggressive nuclear fuel production program directed toward its military requirements and is now estimated to have a substantial stockpile. About 30,000 MTU as U_3O_8 (78 million pounds) of China's inventory is designated as commercial. The Chinese uranium industry is well-developed. Over 300 thousand people are employed by the China National Nuclear Corporation with over 60 thousand employed by the Bureau of Geology branch alone. China does have a large inventory and, like commercial enterprises in the Western World, must reevaluate its options under a new world view. They, too, would prefer to sell material from actual production in order to provide continued employment for their workforce but, like all producers, must choose between holding their material from the market or competing at lower prices.

CONCLUSION

Many factors, some tangible and others psychological or subjective, affect the uranium market. The elimination of barriers between the East and West is one of these factors.

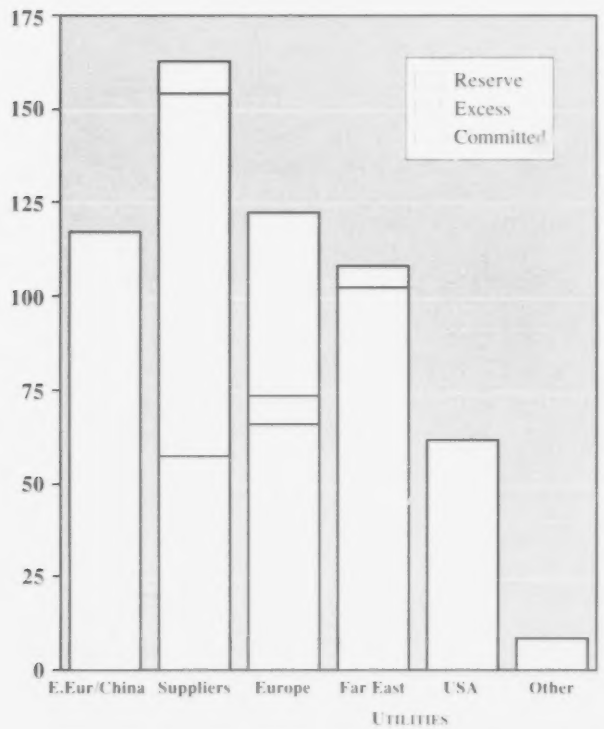
How does this alter our previous expectations for the return to a balanced market? The sale of excess inventories by all participants in the industry will continue, whether they be commercial entities or governments. The one thing that is certain is that the uranium will not be put back into the ground. This inventory redistribution must, and will, continue until the market reaches equilibrium, or until perceptions of minimum acceptable inventory levels change.

Only after inventory redistribution has run its course will users, out of necessity, turn to normal sources of supply, thereby stimulating additional production to meet needs.

The extent to which producers are willing and able to return to the market is a function of when this new supply gap develops. Some producers with partially loaded facilities can respond quickly by increasing production, but not in large quantities. Those with closed facilities can expect increasing difficulties in restarting, as existing facilities deteriorate, technology advances, and regulations change. Success by producers in managing these challenges will depend partially upon stimulation of higher prices and the extent and duration of the resultant price rise.

Although the Soviets and the Chinese have inventory that is designated as "commercial", it remains to be seen whether it will enter the commercial market. The recognized need for hard currency must be balanced with the need for achieving reasonable prices. Some of the inventories will undoubtedly be deployed as security for long-term contracts. Such security arrangements should stabilize the market. However, even if one assumes that a large part of the Chinese and Soviet inventories will be held out of the market, whether for strategic or security purposes, a significant amount of world inventory is still considered excess and likely to be sold or lent. **Figure 4** shows NUEXCO's estimate of this excess inventory, which at a minimum is approximately 130 million pounds U_3O_8.

Figure 4
Worldwide Uranium Inventories
(as of January 1, 1991)



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Any attempts to limit the access of former centrally planned economies to the market would only postpone the inevitable effect of inventory redistribution. All countries, to varying extents, rely on the sale of natural resources to further their economic development, whether it be oil, gas, timber, or minerals like uranium. Quotas, import duties, or embargoes operate essentially to restrict the ability of former centrally planned economies to achieve market-based economies. Whether such efforts are allowed to succeed may, in turn, affect the future stability of political relations among nations. Ironically, those who seek to control market forces end up supporting the inefficient policies of centrally planned economies, while the rest of the world is attempting to entice those nations into full and free world trade.

When government policy or political considerations are allowed to interfere with the free market process, the effects are usually felt for years afterward in ways not previously predicted. The US DOE's fixed-commitment contracting policy for uranium enrichment in a monopolistic period is evidence of this; those effects are still being felt some 19 years later by all market-economy nuclear fuel participants. Consumers may now be reaping the benefits of lower cost fuel, which only partially offsets the high cost of earlier years. Meanwhile, producers are left to absorb the losses from their high investment levels in property, plant, and reclamation.

Barriers to free trade are unlikely ever to disappear completely. Therefore, a central issue for the uranium market is the degree to which government intervention influences what would otherwise be "free trade" and the extent to which such intervention is encouraged by special interests within the industry itself. By its policies and actions, NUEXCO supports full, free, fair trade among all market participants.

We cannot forget, above all, that the future of the nuclear power industry as a whole is primarily dependent on its success in marketing itself to the world's consumers in terms of safety and commercial efficiency, not by making certain inventory holders hold their material from the market, while others either have disposed of or will dispose of their own inventories.

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URANIUM DEPOSITS OF BRAZIL

Brazil is a country of vast natural resources, including numerous uranium deposits (**Figure 1**). In support of the country's nuclear power program, Brazil has developed the most active uranium industry in South America. Brazil has one operating reactor (Angra 1, a 626-MWe PWR), and two under construction. The country's economic challenges have slowed the progress of its nuclear program.

At present, the Poços de Caldas district is the only active uranium production. In 1990, the Cercado open-pit mine produced approximately 45 metric tons (MT) U_3O_8 (100 thousand pounds). Brazil's state-owned uranium production and processing company, Uranio do Brasil, announced it has decided to begin shifting its production from the high-cost and nearly depleted deposits at Poços de Caldas, to lower-cost reserves at Lagoa Real. Production at Lagoa Real is scheduled to begin by 1993. In addition to these two districts, Brazil has many other known uranium deposits, and as a whole, it is estimated that Brazil has over 275,000 MT U_3O_8 (600 million pounds U_3O_8) in reserves.

URANIUM DISTRICTS

Major uranium deposits have been discovered in five primary districts (**Figure 2**). The principal deposits of each district are listed below each district's name, with the name of the state where each deposit is located in given in parentheses:

- Central Ceará District
  - Itataia (Ceará)
- Lagoa Real District
  - Cachoeira (Bahia)
- Poços de Caldas District
  - Agostinho (Minas Gerais)
  - Cercado/Osamu Utsumi (Minas Gerais)
- Seridó District
  - Espinharas (Paraiba)
- Southeastern Paraná Basin
  - Figueira (Paraná)

Other districts with small or low-grade uranium occurrences include:

- Quadrilátero Ferrifero (Minas Gerais)
- Serra de Jacobina (Bahia)
- Rio Preto–Campos Belos (Goiás)
- Northern Paraná Basin, Amorinópolis area (Goiás)
- Tucano Basin (Bahia)

The most important uranium deposits in Brazil are the Itataia deposit with approximately 90,000 MT U_3O_8 of reasonably assured resources (RAR); the Lagoa Real district with approximately 60,000 MT U_3O_8; and the small Espinharas deposit with about 5,000 MT U_3O_8. All three occurrences are associated with Proterozoic metamorphic rocks intruded by leucogranites, and are affected by sodium metasomatism during the Brazilian Orogeny of Late Proterozoic age.

The Lagoa Real and Espinharas deposits are classified as metasomatite-type (albitite) with disseminated uranium mineralization, while the Itataia deposit is vein-type with uraniferous phosphate mineralization. Deposits within the Poços de Caldas alkaline complex of are Upper Tertiary age (Agostinho and Cercado, with approximately 20,000 MT U_3O_8 RAR) and may be termed vein-type or intrusive-type.

Occurrences in the Paraná Basin are of classical sandstone-type emplaced in Middle Permian strata (Figueira deposit—7,000 MT U_3O_8 RAR) and in Lower Devonian sediments (Amorinópolis). Similar mineralization occurs in the Tucano Basin within Lower Cretaceous clastics.

Occurrences in the Rio Preto–Campos Belos region occur in Lower- to Mid-Proterozoic metamorphic rocks and are possibly of unconformity-type. Occurrences in the Quadrilátero Ferrifero and Serra de Jacobina correspond to the oligomictic paleoconglomerate-type.

CENTRAL CEARA DISTRICT

Itataia Deposit

The Central Ceará district is located in northeastern Brazil in the state of Ceará. More than a dozen uranium-phosphate occurrences have been discovered, including Itataia, the largest uranium deposit known in Brazil.

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Figure 1
BRAZIL
Major Uranium Districts

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Figure 2
Geological Map[1] with Major Uranium Districts

[1] some deposit types are tentative—not yet confirmed

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Itataia is located about 170 kilometers west of the coast town of Fortaleza and 50 km southeast of Santa Quitéria. The deposit is an epigenetic, structurally controlled deposit of unusual uranium-phosphorus ore composition. Together with two adjacent deposits (Alcantil and Serrotes Baixos), the deposits account for RAR of about 90,000 MT U_3O_8 at grades ranging from 0.04% U_3O_8 and 5% P_2O_5, to 0.14% U_3O_8 and 21% P_2O_5. Estimated additional resources (EAR) total about 50,000 MT U_3O_8. The deposit is suitable for mining by open-pit methods, with uranium recovery from the phosphatic material estimated at 70 percent.

Other uranium occurrences in the area (Aquiri, Mufumbo and Taperuaba) are associated with episyenites, and are comparable to the Espinharas deposit, which is located 500 km southeast of Itataia in a similar geological environment (see Seridó District).

Geology and Mineralization

Gneiss and carbonate rocks of the Precambrian Caicó Group of the Jaguaribean Fold Belt constitute the principal country rocks at Itataia. The gneissic unit consists of well-foliated biotite-garnet-sillimanite gneiss and amphibolite gneiss. The carbonate unit includes pure and impure marbles with interbedded calc-silicate rocks, which form intercalated lenses or bands as much as 10-km long in gneiss. Numerous post-orogenic granitic and pegmatitic apophyses and stocks, ranging from a few centimeters to tens of meters thick, intrude the older sequences.

The country rocks are altered in various ways. Granite is transformed into a partly vesicular, pinkish rock comparable to feldspar episyenite, as found, for example, in the Limousin, France uranium district. Gneiss exhibits chloritization, sericitization, strong albitization, and impregnation by collophane. Marble underwent scapolitization, superimposed by albitization and fluorapatite crystallization.

The principal uranium mineral is collophane, a cryptocrystalline apatite containing from 60 parts per million (ppm) to more than 150 ppm uranium per one-percent P_2O_5. No discrete uranium mineral has been detected to date. Collophane forms an almost monomineralic rock stained brownish-red from iron-oxide, and referred to as collophanite. It consists of approximately 80-percent collophane, the remainder being calcite, graphite, and ankerite when in marble, and albite, microcline, chlorite, zircon (malacon), and calcite when in episyenite.

Collophanite occurs as:

- massive lens-like lodes filling large cavities, and as veins and veinlets arranged in a stockwork pattern in marble, and to a lesser extent, in episyenite.
- veinlets and disseminations in breccias composed of fragments of marble, calc-silicate and feldspathic (episyenite) rocks.
- disseminations impregnating marble, gneiss, and granite.

Itataia represents a uranium-rich phosphate deposit unique in type and metallogenesis. The mineralization is related to a significant metallogenetic event at the end of the Brazilian Orogeny (450-650 million years ago). The mineralization most likely has a hypogene vein-type origin, but a karst filling genesis may also be envisioned. The only other known notable uranium-phosphate deposits in carbonate rocks outside the former Eastern Bloc countries are Bakouma, Central African Republic, and Pryor Mountains, Wyoming, USA. Both are of supergene origin and associated with karst development.

Shape and Dimension of Deposits

The main deposit at Itataia occurs along a major reverse fault, along which marble has been thrust upon gneiss. A wide cataclastic zone has developed along this fault. Mineralization transgresses the tectonic partitioning.

Surface expression of the Itataia body is 800 m long and 300 m wide, with a fault cutting off the mineralization on the northwest side of the ore body. Massive ore of the first two collophanite modes mentioned above prevails from the surface to a depth of 150 m, and occurs particularly in marble. The third mode extends as discontinuous, lower-grade mineralization to a drill-intersected depth exceeding 300 m.

Massive collophanite hosted in marble, ranges from 0.15% to 0.90% U_3O_8 and 30% to 38% P_2O_5. Respective values in episyenite are 0.07% to 0.15% U_3O_8 and 7.5% to 12.5% P_2O_5, and for stockwork ore in marble the values are 0.04% to 0.1% U_3O_8 and 5% to 15% P_2O_5. Other elements include thorium (162 ppm), yttrium (300 ppm), lanthanum (51 ppm), strontium (3,800 ppm), and locally high values of molybdenum, silver, zinc, and lead in marbles.

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LAGOA REAL DISTRICT

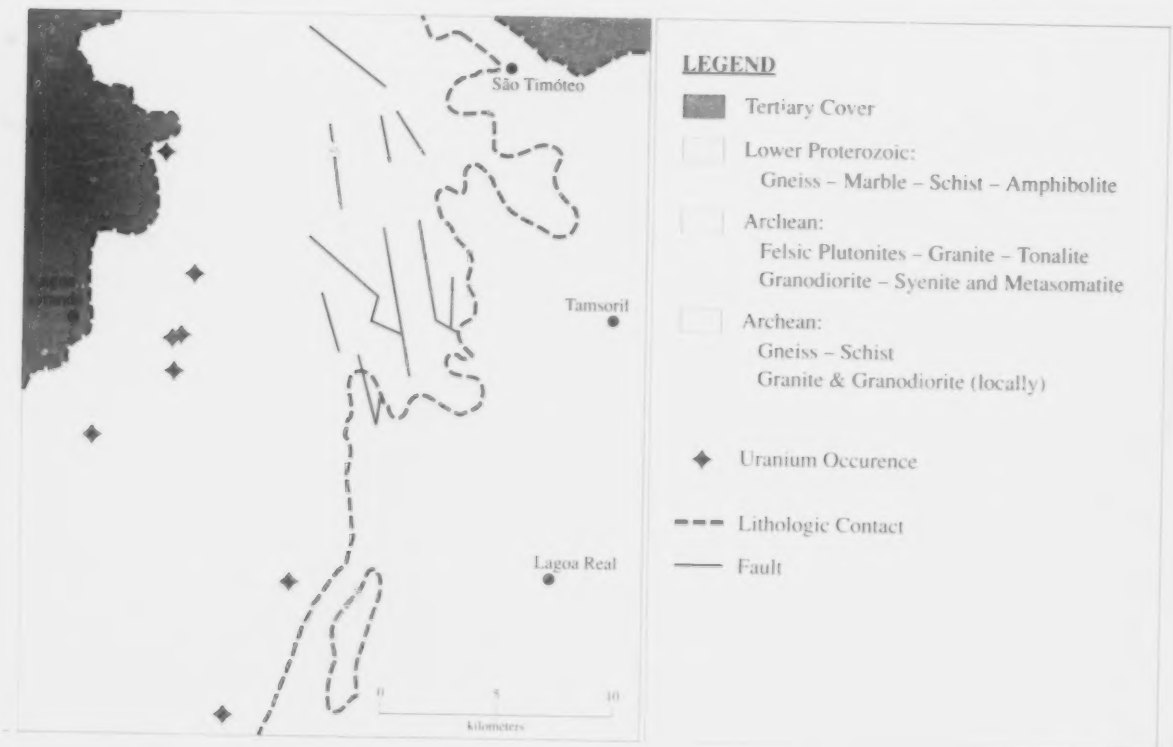
The Lagoa Real district is within the Espinhaço uranium province and situated approximately 20 km northeast of the town of Caetité in Bahia State. Eight major deposits, including Cachoeira, and twenty uranium prospects all associated with albitites of the Caetité Massif, have been discovered to date (**Figure 3**). Total resources of the district amount to about 60,000 MT U_3O_8 (RAR) and 30,000 MT U_3O_8 (EAR). Grades average about 0.15% U_3O_8. Uranio do Brasil is planning to begin uranium production in the Lagoa Real District in 1993. This production will replace that from the higher-cost Poços de Caldas District.

Geology and Mineralization

Polymetamorphic Archean to Lower Proterozoic rocks of the elongated Espinhaço Belt constitute the geological environment of the uranium deposits, with several faults transecting the area.

The principal uranium host rock is an orthogneiss that has been subjected to sodium metasomatism and retrograde alteration. The metasomatism transformed the orthogneiss into rock facies ranging from albite-bearing, microcline-rich, felsic orthogneiss, to albitite. The sodium metasomatism developed along parallel zones, up to several thousand meters long and several hundred meters wide. Uraniferous albitites contain characteristically mafic minerals.

Figure 3
Lagoa Real District Uranium Occurences



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Uraninite is the principal uranium mineral, while pitchblende is rare. Uraninite occurs disseminated in medium to coarse-grained albitite, where it is always associated with layers of mafic minerals. These mineralized albitites are referred to as "linear albitites" due to their tabular or lenticular configuration. Limited lead/uranium dating yields an age of 820 million years for the uraninite crystallization.

With respect to metallogenesis, the metasomatic process involved hydrothermal solutions, which developed in response to thrusting of the basement over fluid-loaded Proterozoic sediments. The thrust mechanism drove the salty pore waters up into the overriding complex by processes governed by an inverted geothermal gradient.

Shape and Dimension of Deposits

Mineralized albitites are distributed in a 20 km-long, north-south oriented belt. The deposits contain a variable number of mineralized lenticular bodies arranged *en echelon* parallel to the regional foliation. Individual ore lenses are from 50 m to 1,200 m long, and from several centimeters to 40 m wide, with an average width of 6 meters. Ore lenses in any single deposit aggregate to a cumulative thickness of 20 m to 100 m. Down dip depth persistence of mineralization is at least 750 m. The average grade is about 0.15% U_3O_8, but can reach up to 3.5% U_3O_8 locally. Thorium tenor is about 0.01%.

POÇOS DE CALDAS DISTRICT

Poços de Caldas is located approximately 250 km north of São Paulo in the southern part of Minas Gerais State. Poços de Caldas is an alkaline intrusive complex, which is part of a series of alkaline intrusions emplaced in the South Brazilian Shield along the eastern edge of the Paraná Basin. Intrusions include alkaline intrusives and carbonatites. These complexes contain some of Brazil's most important deposits, such as the carbonatite deposit at Araxá, which is the largest niobium deposit of the world. Araxá also contains approximately 500,000 MT of thorium and about 60,000 MT U_3O_8. The Poços de Caldas deposit contains rare earth elements, zirconium, molybdenum, uranium, and bauxite as resources.

The principal uranium deposit in Poços de Caldas is the Cercado deposit, in the southeastern section of the intrusive complex. It has mineralization of the polymetallic intrusive type (**Figure 4**). The other key deposit of the Poços de Caldas district is the smaller Agostinho deposit. It is located about six km northwest of Cercado and has redistributed intrusive type mineralization.

Reasonably assured reserves of the Cercado deposit total approximately 20,000 MT U_3O_8 at an average grade of 0.085% U_3O_8. Additional recoverable elements are molybdenum and zirconium, with resources of 25,000 MT MoO_3 at a grade of 0.11% MoO_3, and 172,000 MT ZrO_2 at 0.81% ZrO_2.

Geology and Mineralization

The Poços de Caldas alkaline complex is a roughly circular caldera structure with a diameter of approximately 30 km intruded into Precambrian gneiss. The complex consists of igneous intrusive, extrusive, and volcanoclastic rocks of Upper Cretaceous to Early Tertiary age. Nepheline syenite facies constitute the bulk of the intrusive material. Volcanic extrusives are represented by ash, tuff, lava, and breccias. The surrounding country rock is Precambrian gneiss.

Discontinuous, narrow (less than 10 cm thick) veins of caldasite (a massive rock essentially composed of the zirconium-oxide and zirconium-silicate minerals baddeleyite and zircon, respectively) occur associated with clay within larger fracture zones. The veins contain an average of 0.34% U_3O_8, and were the target of early uranium exploration. The veins also contain from 40% to 75% ZrO_2. Intense weathering, penetrating locally to a depth of 200 m and more, produced a cover of lateritic soil and bauxite. Two almost perpendicular fault systems dissect the caldera.

Cercado Deposit

The Cercado deposit contains uranium mineralization in three adjacent blocks that are separated by faults (**Figure 5**). The blocks are identified as B, E, and A.

Three principal types of primary ore are distinguished as follows:

- Mineralized veins of uranium, molybdenum, fluorine, and minor amounts of zirconium and thorium, emplaced within steeply dipping breccia dikes up to five meters wide and at least 250 m deep.
- Clusters or pockets with enriched uranium bands located discontinuously along faults, dikes, and diatremes.
- Lenticular zones with disseminated uranium mineralization within pyroclastic rocks.

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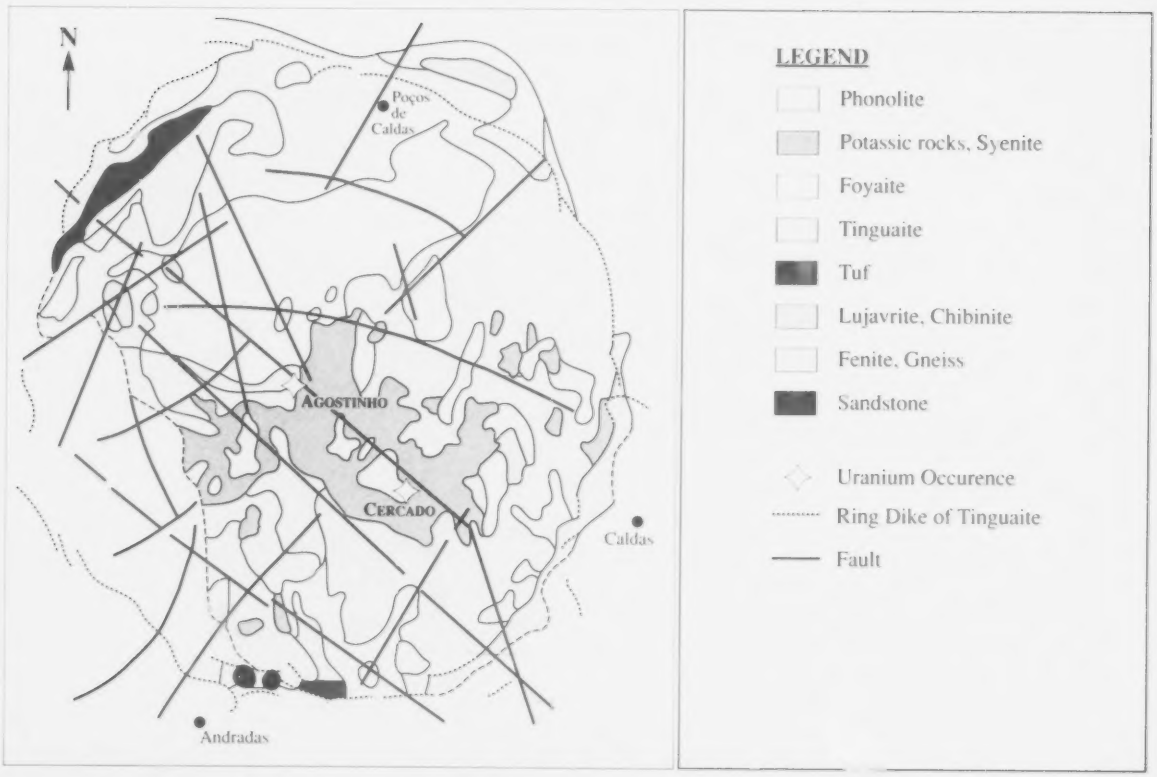
Figure 4
Poços de Caldas Uranium District



With respect to metallogenesis, the original mineralization was derived from pulsations of magmatic mesothermal volatile fluids along fractures, breccia dikes, and diatremes. Weathering resulted in uranium redistribution forming subhorizontal mineralization along and below an oxidation interface.

Mineralization, Shape, and Dimension of Deposits

Block B contains mineralization in an area 1,240 m long, 440 m wide, and 370 m deep. Host rocks are thick pyroclastics that fill a depression. Ore consists of black uranium oxides associated with fluorite, pyrite, and molybdenum minerals. The ore minerals concentrate to shoots or lenses of disseminated mineralization in basal parts of depressions, and uranium grade increases toward the basal contact. Redistributed mineralization occurs in the upper part of the deposit. Block B accounts for about 65 percent of the Cercado reserves, at an average grade of 0.074% U_3O_8.

Block A covers an area about 900 m long and 530 m wide, in which primary mineralization occurs in steeply to vertically dipping dikes of tuffitic breccia with tinguaite fragments. The dikes cut compact lavas. Uranium minerals are pitchblende and coffinite, and may be associated with zircon, baddeleyite, pyrite, fluorite, jordisite, ilsemannite, galena, and sphalerite. Uranium redistribution resulted in local formation of neo-sooty pitchblende. Block A accounts for about twenty percent of the Cercado reserves at an average grade of 0.21% U_3O_8.

Block E is sandwiched between blocks A and B. It occupies a subhorizontal, slightly dipping zone extending 1.1 km in length, 500 m in width, and 140 m in depth. Only redistributed mineralization is present. Uranium is concentrated by adsorption to limonite, which prevails in the upper 10 m, and as uraniferous clay nodules up to 10 cm-thick. The nodules have a mixture of clay and black uranium oxides as a core,

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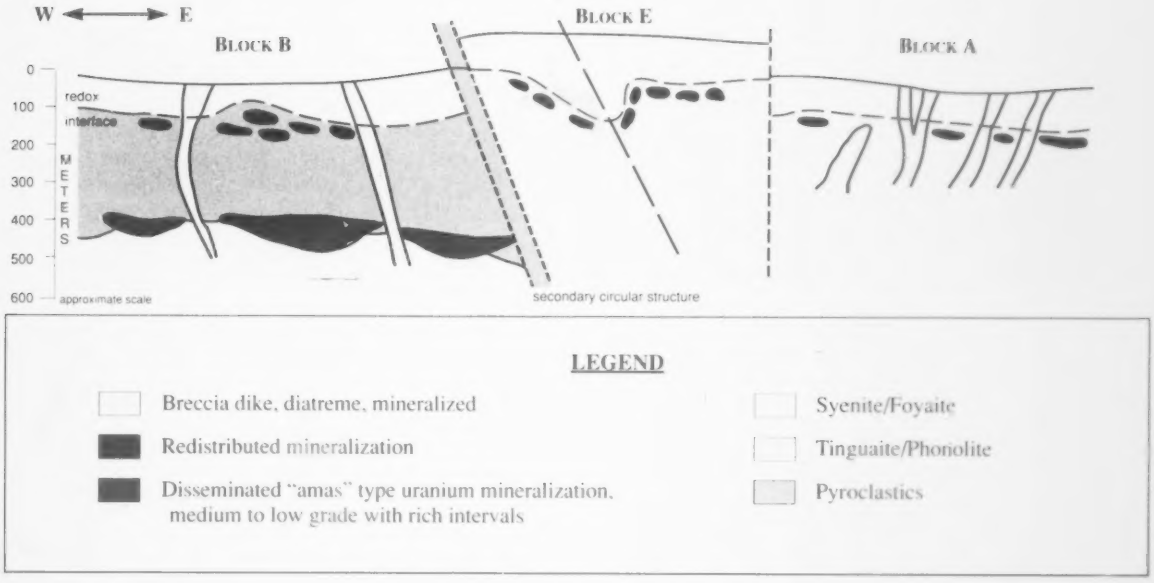
Figure 5
Cercado Uranium Deposit



and pitchblende with pyrite on the outside. Nodules occur preferentially at the intersections along faults. Uranium mineralization occurs in irregularly shaped accumulations of highly variable tenor and size, hosted by highly fractured and altered tinguaite and phonolite. Block E accounts for fifteen percent of the Cercado reserves at an average grade of 0.117% U_3O_8.

Production

The Cercado mine (also referred to as the Osamu Utsumi mine) is owned by NUCLEBRAS, and began operation in 1982. It is an open pit operation with a production capacity of 750,000 MT ore per year from the three different blocks. The processing plant (Alamine solvent type extraction) has a capacity of 2,500 MT ore per day, with a recovery rate of approximately 70 percent. The nominal annual production capability is 500 MT U_3O_8 and 285 MT Mo.

Agostinho Deposit

The Agostinho deposit contains mineralization similar to that of Block A at Cercado. Two mineralized bodies occur in subvertically dipping breccia dikes. Mineralization consists of pitchblende and molybdenum minerals (jordisite, molybdenite, ilsemannite) emplaced in a matrix of fluorite, pyrite, sericite, and zircon. Resources are about 5,000 MT U_3O_8 and 7,000 MT MoO_3.

SERIDÓ DISTRICT

Espinharas Deposit

The Seridó district extends from southern Rio Grande do Norte state into north-central Paraiba state in northeastern Brazil. A number of uranium showings have been discovered, mostly within Upper Proterozoic leucogranites, and a few occurrences in Proterozoic metasediments. Those of possible economic potential occur in albitized rocks, and include the Espinharas deposit. This deposit, located 25 km north of the town of Patos in north-central Paraiba state, contains about 5,000 MT U_3O_8 (RAR), and approximately the same amount in the EAR category. The average grade is about 0.1% U_3O_8, at a cut-off grade of 0.05% U_3O_8.

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Geology and Mineralization

The Espinharas deposit is situated within the Seridó Basin, which is part of the Cariri Orogenic Belt. Country rocks are Lower Proterozoic metasediments of the Seridó and Caicó groups intruded by several generations of granite during the Brazilian Orogeny.

The predominant rock at Espinharas is amphibolite-biotite gneiss with intercalated minor amphibolite and tacite of the Caicó Formation. A basement complex of Archean granodiorite and porphyritic granite crops out west of the deposit. Numerous alkali-granite, pegmatite, and ultrabasic dikes, ranging in width from several centimeters to as much as 50 m, transect the older rocks. A regional pre-mineralization fault is the prominent structure at the deposit. Many younger faults displace the deposit into numerous blocks.

Host rock alteration is reflected by albitization, arfvedsonitization, hematitization, desilicification, argillitization, chloritization, and carbonatization. Principal host rock is a pink, porous, albitized feldspathic rock, which is considered a metasomatic derivative of a former granite. It occurs as dikes and lenses ranging in width from a few centimeters to 100 meters.

The other main host rock is strongly altered biotite-amphibole gneiss. Identified uranium minerals are predominantly uraninite and betafite. Pitchblende, coffinite, and colored uranium minerals, mainly uranophane, occur in minor amounts. Associated minerals include pyrite, chalcopyrite, and apatite. These uranium minerals are disseminated throughout the albitized host rock and in localized concentrations. In addition to these minerals, a large part of the contained uranium is present as an unidentified, non-refractory complex uranium phase.

No convincing hypothesis on the mineralization at Espinharas has been forwarded as yet. It is speculated that either hypogene hydrothermal fluids caused metasomatism, alteration, and mineralization, or that the Espinharas mineralization is derived by processes comparable to those that formed the episyenite-hosted mineralization in the Ceará district.

Shape and Dimension of Deposits

Uranium mineralization extends over a length of 2,200 meters, a width (at surface) of 20-120 meters, and a depth of 250 meters. Ore occurs in discontinuous and irregular lenses that are a few centimeters to several tens of meters thick. The lenses are stacked in *en echelon* pattern parallel to the regional foliation. The average grade of most of the ore is 0.1% U_3O_8 with intercalated sections exceeding 0.12% U_3O_8.

PARANÁ BASIN

The Paraná Basin spreads over the southern part of Brazil and into neighboring Argentina, Paraguay, and Uruguay. Two districts with sandstone-type uranium deposits in Paleozoic sediments have been discovered: Figuiera, in northeastern Paraná State, with approximately 8,000 MT U_3O_8 in Permian sediments; and Amorinópolis with approximately 5,000 MT U_3O_8 in Devonian sediments, located about 800 km north of Figueira in Goiás state. Several other uranium occurrences, most of small size, are located in the Paraná Basin: Alfredo Wagner and Domo de Lájes in Santa Caterina state; Teresa Christina and Cándido de Abreu in Paraná; Lages in Santa Catarina; Domo de Araguainha in Mato Grosso state; and in the Melo-Fraile Muerto area of northeast Uruguay, near the Brazilian border.

FIGUEIRA DISTRICT

The district lies near the central-eastern margin of the Paraná Basin, about 400 km west of São Paulo. Several sandstone-type uranium occurrences such as Siqueira Campos, Ibaiti, Carvaozinho, Figueira, Sapopema, and Telemaco Borba have been detected in a 100 km long belt along the outcropping Permian Rio Bonito Formation.

Figueira Deposit

The best known deposit is Figueira, located 5 km northwest of the village of Figueira. It contains about 8,000 MT U_3O_8 at grades varying between 0.02% and 0.50% U_3O_8.

Geology and Mineralization

The deposit is situated in the middle unit of the three-unit Permian Rio Bonito Formation. This uranium host unit is approximately 85 m thick, and consists of siltstone intercalated with limestone, carbonaceous mudstone, coal seams, and carbonate cemented sandstone. Uranium is hosted by sandstone, carbonaceous siltstone, and coal.

Uranium is present as pitchblende and minor coffinite in the carbonate matrix of sandstone, and in urano-organic complexes with phosphate and barium in siltstone and

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carbonaceous claystone and coal. Associated elements are molybdenum, zinc, lead, copper, arsenic, thorium, and traces of selenium, vanadium, nickel, and germanium. Pyrite is ubiquitous in uraniferous sections.

A multistage model is proposed for the metallogenesis. Initially, uranium was syngenetically introduced and concentrated in the paludal sediments, while epigenetic processes concentrated uranium in coarse-grained channel sandstone. Diagenetic activity redistributed the uranium.

Shape and Dimension of Deposits

The main ore body of Figueira is of lenticular configuration and located in a channel measuring 600 m long and 300 m wide. Individual mineralized layers in the channel range from 1.5 to 3.5 m thick, and contain about 0.2% to 0.5% U_3O_8. Uranium grade drops to between 0.02% and 0.08% U_3O_8 outside the channel. The ore is in radiometric disequilibrium about 20 percent in favor of chemical uranium. Thirty to forty percent of the resources are contained in carbonaceous siltstone and coal.

AMORINÓPOLIS DISTRICT

A great number of uranium showings have been discovered in the Devonian Porta Grossa Formation along the northeastern margin of the Paraná Basin. The most explored occurrences are those in the Amorinópolis–Iporá area, situated about 375 km southwest of Brasilia. They contain low-grade uranium resources estimated at 5,000 MT U_3O_8.

Geology and Mineralization

The Middle Devonian Porta Grossa Formation consists of siltstone, sandstone, and mudstone which rest on sandstone of the Silurian Furnas Formation and Precambrian crystalline basement. During the Cretaceous Era, block faulting resulted in horst and graben structures, and dikes of ultrabasic and alkaline composition intruded. Three settings for uranium mineralization are present. They are associated with:

- Redox fronts in feldspathic sandstone filling inconspicuous paleochannels.
- Fractures and faults, some them occupied by ultrabasic and alkaline dikes.
- Laterite capping large areas, particularly mesa buttes.

The first type constitutes the most important uranium mineralization and includes the Amorinópolis deposit. Host rock is a 3-8 m thick carbonaceous feldspathic sandstone containing oxidized horizons. Uranium occurs in clay galls rich in organic matter and iron-oxides, and in irregular distributions on bedding planes and in fractures.

Mineralization, although irregular in grade, is fairly continuous and can be traced along channels about 400 m long, 20-40 m wide, and 1-10 m thick. The uranium appears to be controlled primarily by coarse-grained sandstone embedded between mudstone or siltstone layers. Certain structural control has been exerted by faults, dikes, and sills. Uranium minerals include pitchblende and coffinite at depth, and colored uranium minerals in weathered zones. Metallogenetic models include epigenetic rollfront-type processes as well as syngenetic uranium concentrations.

QUADRILÁTERO FERRIFERO DISTRICT

This district is in the southern part of Minas Gerais state. Two areas with oligomictic, quartz-pebble type uranium mineralization have been explored in some detail: Serra das Gaivotas and Gandarela. Cumulative resources are estimated at 15,000 MT U_3O_8, with grades up to 200 ppm uranium and 0.5 ppm gold. Similar mineralization also occurs at Onca do Pitangui, located about 100 km northwest of Belo Horizonte.

Geology and Mineralization

Archean and Lower Paleozoic rocks constitute the Quadrilátero Ferrifero. They include the uraniferous Lower Proterozoic Moeda Formation, which rests unconformably on Archean granite and gneiss. A prominent paleorelief has developed locally on the basement, with variations in altitude exceeding 100 meters. Consequently, the Moeda Formation ranges in thickness from 15 m to 320 m.

Serra das Gaivotas Deposit

The deposit is located 30 km south of Belo Horizonte in the western part of the Quadrilátero Ferrifero. Uranium and low-grade gold mineralization occurs in paleochannels filled with oligomicitc quartz-pebble conglomerate up to 5 m thick near the base of the Moeda Formation. Quartz and rare quartzite pebbles from 2 to 3 cm in diameter are the principal clasts. They are embedded in a matrix of sericite and quartz, with abundant pyrite (5-20 volume-percent) and heavy minerals. The matrix constitutes 60-80 volume-percent of the rock, and contains as principal uranium minerals uraninite, pitchblende, coffinite, and thucholite. Other heavy minerals are monazite, zircon, rutile pyrrhotite, chalcopyrite,

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pyrite, and traces of gold. Uranium tenor is about 100 ppm. The ThO_2/U_3O_8 ratio ranges from 0.11 to 1.15 and averages 0.46. The origin of the uranium, gold, and other heavy minerals is syngenetic. Later processes modified the primary mineralization.

Gandarela Deposit

The deposit is located 65 km southeast of Belo Horizonte in the central part of the Quadrilátero Ferrifero. Mineralization corresponds to that at Serra das Gaivotas and is hosted by highly matured oligomictic conglomerates containing pyrite and carbonaceous material. Gold is commonly associated with uranium at the base of the Moeda Formation. Resources are estimated at 8,000 MT U_3O_8.

SERRA DE JACOBINA DISTRICT

The Serra de Jacobina district is located in north-central Bahia state. Mineralization is of the oligomictic conglomerate type similar to the Witwatersrand uranium-gold deposits of South Africa.

Geology and Mineralization

Uranium and gold mineralization occurs in conglomerates of the Serra de Corrego Formation at the base of the Lower Proterozoic Jacobina Series, which is correlated with the Minas Series in the Quadrilátero Ferrifero. The Jacobina Series is a folded and metamorphosed sedimentary sequence several thousand meters thick. It consists of thin-bedded to massive quartzite and conglomerates, overlain by itabirites in the lower section and phyllites higher up. The metasediments unconformably rest on Archean granite and gneiss of the São Francisco Craton. Faults, and basic to ultrabasic dikes, dissect the whole complex.

Four conglomeratic horizons are known in the lower section of the series, two of which, the Liberino Reef and the Piritoso Reef (each 1.5-2.5 m thick), are uraniferous and lie at least 150 km above the unconformity. The two horizons are composed of well-compacted quartz pebbles two to four centimeters in diameter, embedded in a highly silicified quartz-sericite matrix containing abundant pyrite and chlorite. The principal uranium minerals are uraninite, pitchblende, and brannerite. Other heavy minerals include rutile, zircon, pyrite, and chromite. The latter constitutes up to 35 percent of the heavy mineral fraction in gold operations. Uranium and gold tenors in the Canavieiras gold mine near Jacobina range from 100 to 200 ppm, and 7 to 15 ppm, respectively.

RIO PRETO–CAMPOS BELOS DISTRICT

The district is located north of Brasilia, in the eastern part of Goiás state. A number of small, structurally controlled uranium showings have been discovered, most of them in the Rio Preto area. Numerous showings also occur 140 km further northeast in the Campos Belos area. Total resources for the district are estimated at 1,000 MT U_3O_8.

Geology and Mineralization

The regional geology comprises an Archean to Lower Proterozoic basement complex (granite gneiss with subordinate migmatite and pegmatite) which hosts the uranium occurrence of Campos Belos. Some granite intrusives have been altered to form tin greisens that are associated with gold and high uranium contents.

The basement is overlain by the Lower Proterozoic Ticunzal Formation, host to the uranium occurrences at Rio Preto, where two major types of host rocks are present:

- Cataclastic, graphitic, biotite-muscovite schists with pegmatite injections and quartz veins contain, on schistosity planes and in fractures, uraninite in depth, and hexavalent uranium minerals near the surface.
- Dike-like bodies of biotite schist, with locally abundant hornblende and apatite locally, are emplaced with sharp contacts in paragneiss, and both are affected by cataclasis. Biotite is a recrystallization product of metasomatism. Uranium, at depth as uraninite, is irregularly and discontinuously dispersed in small fractures along the contact to paragneiss.

Uranium is associated with pyrite and chalcopyrite. Host rocks are commonly altered by chloritization, hematitization, and argillitization. Schists containing little biotite are principally barren of uranium.

More than ten mineralized zones have been explored in some detail at Rio Preto. They typically are a few hundred meters long and about one hundred meters wide. The larger mineralized structures average 0.85 m thick, and extend at least 80 m deep, with a grade 0.06-0.20% U_3O_8, and may contain several hundred metric tons U_3O_8.

Mineralization at Campos Belos is in fault-controlled, cataclastic leucocratic gneiss of the Basal Complex. Ore shoots are 2-3 m thick and extend at least 60 m deep.

Hypotheses on ore formation range from supergene to hydrothermal related, to granite intrusion or lateral-secretionary related, to final tectonic phases of the Brazilian Orogeny, with redistribution of uranium from earlier vein deposits along the Proterozoic unconformity.

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NUCLEAR INDUSTRY CALENDAR

1991

Sept. 22-25 ***International Uranium Seminar '91*** (The Don Cesar Hotel, St. Petersburg/Tampa, Florida).
Sponsored by the U.S. Council for Energy Awareness.
Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.

Sept. 29-Oct. 2 ***American Mining Congress Mining Convention*** (Salt Lake City, Utah).
Contact: AMC Convention Office: 202-861-2800; or Fax: 202-861-7535.

Oct. 24 ***Canadian Participation in World Fusion: Opportunities and Challenges*** (Skyline Hotel, Ottawa, Canada).
Sponsored by the Canadian Nuclear Association and the Canadian Nuclear Society.
Contact: Sylvie Caron, CNA; 416-977-6152; Fax: 416-979-8356;
or mail: 144 Front St., Suite 725, Toronto, Ontario, Canada M5J 2L7.

Oct. 29-31 ***Uranium Hexafluoride Handling*** (William G. Pollard Auditorium, Oak Ridge, Tennessee).
Sponsored by Martin Marietta Energy Systems, Inc.
Contact: Diane Duck, MMES; 615-576-1676; or Fax: 615-576-1561.

Nov. 10-13 ***Nuclear Energy Forum*** (Westin St. Francis Hotel, San Francisco, California).
Sponsored by the U.S. Council for Energy Awareness.
Contact: USCEA Conference Office; 202-293-0770; Telex: 7108249602; Fax: 202-785-4113.

Nov. 10-15 ***American Nuclear Society Winter Meeting*** (Hilton Hotel, San Francisco, California).
Contact: ANS Meetings Department; 708-352-6611.

Nov. 14-15 ***World Electricity Conference*** (Hotel Inter-Continental, London, United Kingdom).
Sponsored by the Financial Times and Power In Europe.
Contact: FT Conference Organization; 126 Jermyn Street, London SW1Y 4UJ, UK;
Phone: 071-925-2323; Fax: 071-925-2125; Telex: 27347 FTCONF G.

Dec. 2-4 ***PLEX '91 BERLIN – Nuclear Plant Life Extension, Upgrading, Repair, Refurbishment, Uprating and Ageing*** (Hotel Steigenberger, Berlin, Germany). Sponsored by Nuclear Engineering International.
Contact: Conference (PLEX); Status Meetings Ltd., Festival Hall, Petersfield, Hampshire, GU31 4JW, UK;
Phone: 44-730-66544; Fax: 44-730-68865; Telex: 86105 CONFER G.

1992

April 12-16 ***8th Pacific Basin Conference*** (Taipei, Taiwan).
Sponsored by the American Nuclear Society.
Contact: ANS Meetings Department; 708-352-6611.

May 5-7 ***Annual Meeting on Nuclear Technology '92*** (City Conference Hall, Karlsruhe, Germany).
Sponsored by the German Nuclear Society and the German Atomic Forum.
Contact: Congress Office JK'92; INFORUM GmbH, Heussallee 10, W-5300 Bonn 1; Phone: 0228-507-223.

Sept. 21-23 ***Second International Conference on Training for Operation & Maintenance in the Nuclear Industry*** (The Moat House International Hotel, Stratford-upon-Avon, United Kingdom).
Sponsored by the Institution of Nuclear Engineers.
Contact: INE Conference Secretary; 081-698-1500 or 081-698-4750; Fax: 018-695-6409.

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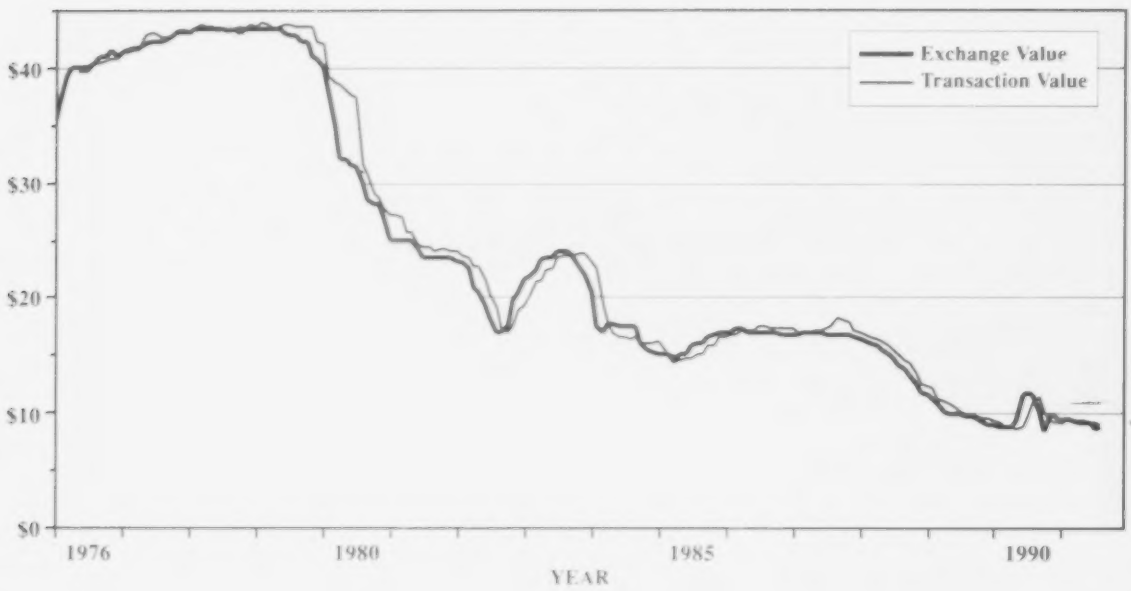
HISTORICAL MARKET DATA

NUEXCO HISTORICAL EXCHANGE VALUE AND TRANSACTION VALUE

(in US dollars per pound U_3O_8)



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HISTORICAL MARKET VALUES

Exchange Values

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	6.35	6.35	6.40	6.45	6.50
1969	—	6.35	6.10	6.10	6.25	6.25	6.20	6.20	6.15	6.15	6.15	6.20
1970	6.30	6.30	6.30	6.30	6.30	6.30	6.30	6.20	6.15	6.15	6.15	6.15
1971	6.20	6.20	6.20	6.20	6.15	6.05	6.00	5.95	5.95	5.95	5.95	5.95
1972	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95
1973	5.95	6.00	6.10	6.20	6.45	6.50	6.50	6.50	6.50	6.50	6.75	7.00
1974	7.70	7.90	8.00	9.00	9.50	10.50	11.50	12.00	12.50	14.00	14.75	15.00
1975	16.00	16.00	18.00	20.00	21.00	23.00	24.70	26.00	26.00	28.50	30.00	35.00
1976	35.20	37.00	39.25	40.00	40.00	40.00	40.00	40.40	41.00	41.00	41.50	41.00
1977	41.35	41.50	41.60	41.60	42.00	42.25	42.25	42.25	42.40	42.75	43.20	43.20
1978	42.90	43.25	43.25	43.25	43.40	43.40	43.40	43.10	43.25	43.00	43.25	43.25
1979	43.25	43.25	43.25	43.25	43.25	43.00	42.70	42.70	42.20	42.20	41.00	40.75
1980	40.00	38.00	35.00	32.00	32.00	31.50	31.50	30.00	28.50	28.00	28.00	27.00
1981	25.00	25.00	25.00	25.00	25.00	24.25	23.50	23.50	23.50	23.50	23.50	23.50
1982	23.00	23.00	22.50	20.75	20.50	19.25	18.25	17.00	17.00	17.50	19.75	20.25
1983	21.50	21.75	22.25	23.25	23.50	23.50	24.00	24.00	24.00	23.50	22.50	22.00
1984	20.50	17.50	17.00	17.75	17.75	17.50	17.50	17.50	17.50	16.00	15.50	15.25
1985	15.00	15.00	15.00	14.25	15.00	15.00	15.75	16.00	16.00	16.50	16.75	17.00
1986	17.00	17.00	17.25	17.25	17.00	17.00	17.00	17.00	17.00	17.00	16.75	16.75
1987	16.65	16.75	17.00	17.00	17.00	16.90	16.75	16.65	16.65	16.75	16.65	16.55
1988	16.30	16.15	15.90	15.75	15.40	15.10	14.75	14.15	13.75	13.15	12.50	11.75
1989	11.60	11.20	10.70	10.10	9.85	9.80	9.80	9.70	9.60	9.40	9.20	9.00
1990	8.85	8.70	8.80	8.80	9.25	11.60	11.70	11.45	10.10	8.35	9.80	9.70
1991	9.10	9.50	9.30	9.10	9.20	9.05	8.55	**8.75**				

US Premium (Relative to the Exchange Value)

Determined as of the last day of the month indicated ($US/lb U_3O_8)

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	—	—	—	—	—	—	—	—	—	—	0.65	0.75
1987	0.85	1.00	1.50	1.50	0.90	0.60	2.50	2.35	2.10	1.65	0.85	0.65
1988	0.70	0.50	0.15	0.25	0.60	0.00	0.00	0.00	0.00	0.00	**Discontinued**	

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HISTORICAL MARKET DATA

UF_6 Values

Year	Determined as of the last day of the month indicated ($US/kg U as UF_6)											
	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1985	—	—	—	40.50	42.50	42.50	44.00	44.50	44.50	46.00	46.00	47.00
1986	47.00	48.00	48.00	48.50	48.25	48.25	48.25	48.00	48.00	48.00	48.00	47.75
1987	47.75	48.00	48.00	48.00	47.75	47.75	47.50	47.00	46.75	47.00	47.00	47.00
1988	46.50	46.00	45.50	45.25	44.75	44.00	42.75	41.00	40.75	39.00	37.50	35.50
1989	34.75	34.00	33.00	30.50	30.25	30.25	30.00	29.75	29.75	28.25	27.75	26.50
1990	25.90	25.25	24.40	24.40	25.50	32.00	32.50	32.25	29.50	24.75	28.75	28.75
1991	27.50	27.75	27.50	27.25	27.60	27.25	25.75	**26.25**				

US Premium (Relative to the UF_6 Value)

Year	Determined as of the last day of the month indicated ($US/kg U as UF_6)											
	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	—	—	—	—	—	—	—	—	—	—	2.50	2.50
1987	2.50	2.50	3.50	3.00	2.25	1.75	6.50	6.00	4.25	3.10	2.25	2.00
1988	1.25	1.25	0.50	0.50	1.00	0.00	0.00	0.00	0.00	0.00	**Discontinued**	

Conversion Values

Year	Determined as of the last day of the month indicated ($US/lb U as UF_6)											
	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1981	1.20	1.20	1.20	1.40	1.15	1.15	1.15	1.10	1.10	1.10	1.20	1.20
1982	1.20	1.20	1.20	1.20	1.00	1.00	1.00	0.90	1.10	1.60	1.45	1.45
1983	1.20	1.40	1.40	1.20	1.20	1.20	1.10	1.10	1.00	0.60	0.60	0.60
1984	0.60	0.30	0.80	0.80	0.80	0.00	0.00	0.80	1.00	1.00	0.80	0.80
1985	1.00	1.00	1.00	1.50	1.50	1.60	1.60	1.60	1.60	1.60	1.60	1.60
1986	1.60	1.80	1.90	1.80	1.80	1.80	1.80	1.90	1.90	1.90	1.80	1.80
1987	1.80	1.80	1.80	1.80	1.80	1.80	1.90	1.90	1.90	1.90	1.90	1.90
1988	1.90	1.80	1.80	1.80	1.80	1.80	1.85	1.95	1.95	1.95	1.95	1.95
1989	1.95	1.95	1.95	1.95	1.95	1.95	1.95	1.90	1.90	1.80	1.75	1.65
1990	1.50	1.50	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45
1991	1.45	1.45	1.45	1.45	1.50	1.50	1.50	**1.60**				

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Transaction Values

Year	Determined as of the last day of the month indicated ($US/lb U_3O_8)											
	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1976	—	—	—	—	39.60	39.70	39.70	40.40	40.30	40.60	40.70	40.70
1977	41.30	41.30	41.40	41.50	42.80	42.90	43.00	42.60	42.50	42.80	42.90	42.90
1978	43.10	43.30	43.70	43.60	43.60	43.20	43.30	43.40	43.40	43.60	43.40	43.70
1979	43.60	43.80	43.70	43.40	43.60	43.70	43.70	43.60	43.60	43.60	43.50	42.30
1980	42.00	39.30	38.60	38.40	37.90	37.60	37.30	31.60	30.60	29.00	28.70	27.70
1981	27.20	27.20	27.00	25.70	25.70	24.50	24.40	24.30	23.90	24.10	24.10	24.00
1982	24.00	23.70	23.40	22.60	22.70	21.50	20.30	19.10	17.30	17.00	17.55	18.80
1983	19.35	20.00	21.35	21.40	22.35	22.45	23.50	23.60	23.65	23.65	23.85	23.85
1984	23.05	22.50	19.25	17.90	17.00	16.50	16.60	16.40	16.55	16.05	15.90	15.90
1985	16.20	15.70	15.05	14.90	14.45	14.60	14.75	15.10	15.10	15.75	15.80	16.55
1986	16.55	16.70	16.70	17.10	17.15	17.20	17.50	17.45	17.35	17.25	17.30	17.35
1987	17.35	16.90	16.95	17.00	17.20	17.10	17.30	17.55	18.20	18.05	17.80	17.20
1988	16.85	16.65	16.55	16.45	16.10	15.80	15.45	15.00	14.50	14.40	13.30	12.50
1989	12.25	12.00	11.25	11.00	10.75	10.45	9.95	9.80	9.80	9.65	9.55	9.40
1990	9.25	9.05	8.75	8.65	8.55	8.80	9.75	10.80	11.40	10.10	9.30	9.15
1991	9.40	9.45	9.35	9.30	9.30	9.20	9.15	**8.95**				

SWU Values

Year	Determined as of the last day of the month indicated ($US per SWU)											
	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1986	80	80	80	80	75	78	78	78	78	78	80	80
1987	80	80	77	77	75	73	75	75	73	69	73	73
1988	73	73	70	68	68	68	68	65	65	65	65	65
1989	65	67	67	67	66	66	66	65	63	59	57	54
1990	54	50	50	50	50	50	50	50	50	51	51	51
1991	51	50	52	52	54	59	66	**67**				

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HISTORICAL MARKET DATA

Loan Rates

Year	Determined as of the last day of the month indicated (Percent per Annum)											
	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	4.00	4.00	4.00	4.00	4.00
1969	4.00	4.00	5.00	5.00	5.00	5.00	5.00	5.00	6.00	6.00	6.00	6.00
1970	6.00	6.20	6.40	6.50	6.50	6.50	6.50	5.00	6.50	6.00	5.50	5.50
1971	5.00	4.75	4.75	4.75	5.00	5.25	5.25	5.25	5.25	5.25	4.50	4.50
1972	4.00	4.00	4.00	4.50	4.50	4.50	5.00	5.00	5.00	5.00	5.00	5.00
1973	5.50	5.50	5.75	5.75	6.00	6.25	7.00	7.00	7.00	7.00	7.50	8.00
1974	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
1975	8.00	7.00	7.00	7.00	7.00	6.50	6.50	6.50	6.50	6.50	6.50	6.50
1976	6.50	6.50	6.50	6.50	*	*	*	*	*	*	*	*
1977	*	*	*	*	6.50	6.50	6.50	6.75	7.25	7.25	7.25	7.25
1978	7.25	7.00	7.00	7.00	7.00	7.50	7.75	7.75	7.75	7.00	7.00	7.00
1979	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
1980	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
1981	7.00	7.00	7.00	7.00	7.00	5.50	5.50	5.50	5.50	6.00	6.00	6.00
1982	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1983	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1984	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
1985	6.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00
1986	5.00	5.00	5.00	5.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
1987	3.00	3.00	3.00	3.00	3.00	3.00	3.00	4.00	4.00	4.00	3.50	3.50
1988	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1989	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1990	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
1991	3.50	3.50	3.50	3.50	3.50	3.50	3.50	**3.50**				

* Float with Prime Rate

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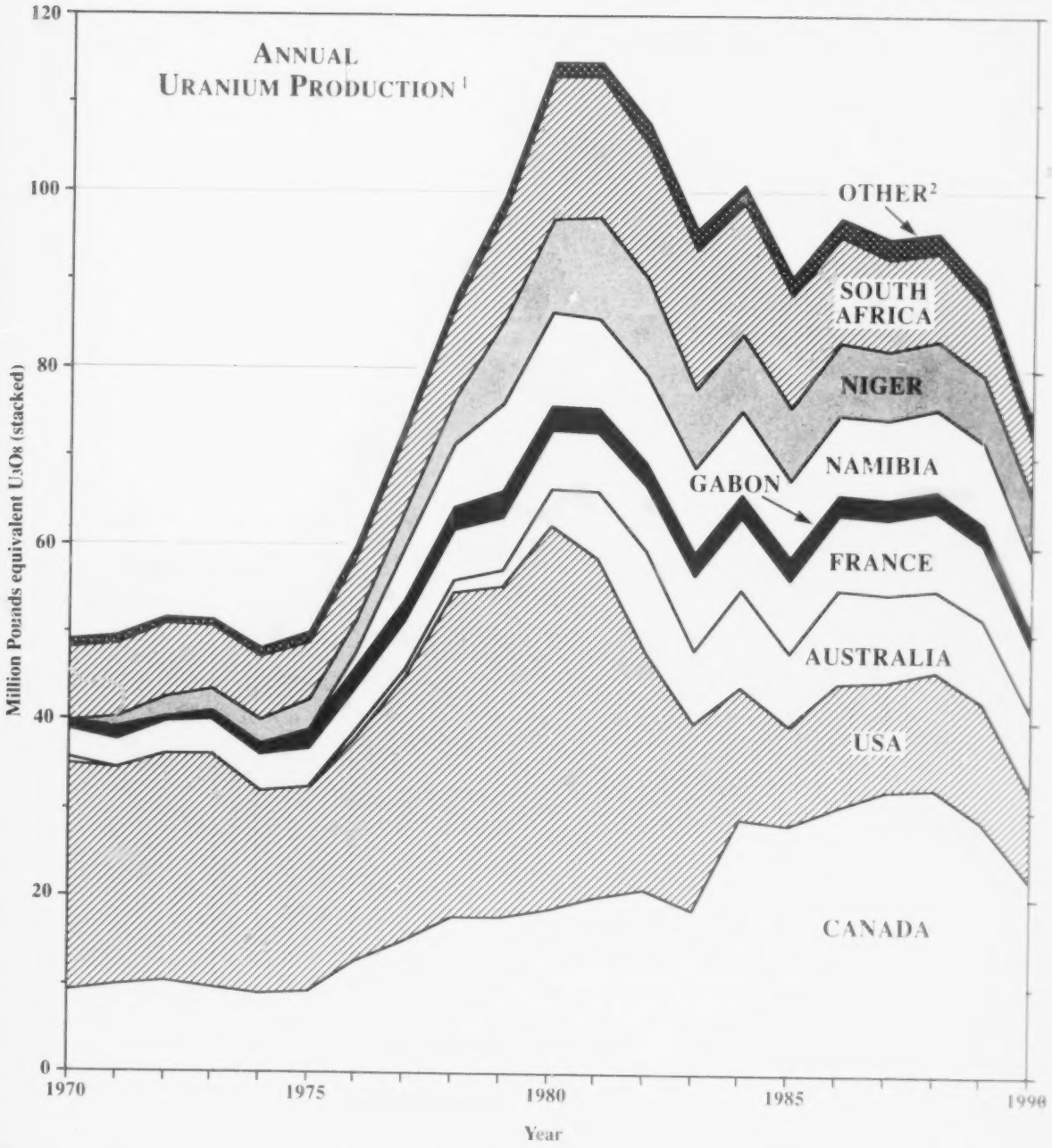

[1] Estimated world uranium production in 1990 totalled 85.2 million pounds equivalent U_3O_8 — (Australia: 9.1 – Canada: 22.0 – France: 7.4 – Gabon: 1.8 – Namibia: 8.0 – Niger: 7.4 – South Africa: 6.4 – USA: 10.2 – Other[2]: 2.2).

[2] Other includes: Argentina, Belgium, Brazil, India, Pakistan, Portugal, Spain, western Germany, and Yugoslavia.

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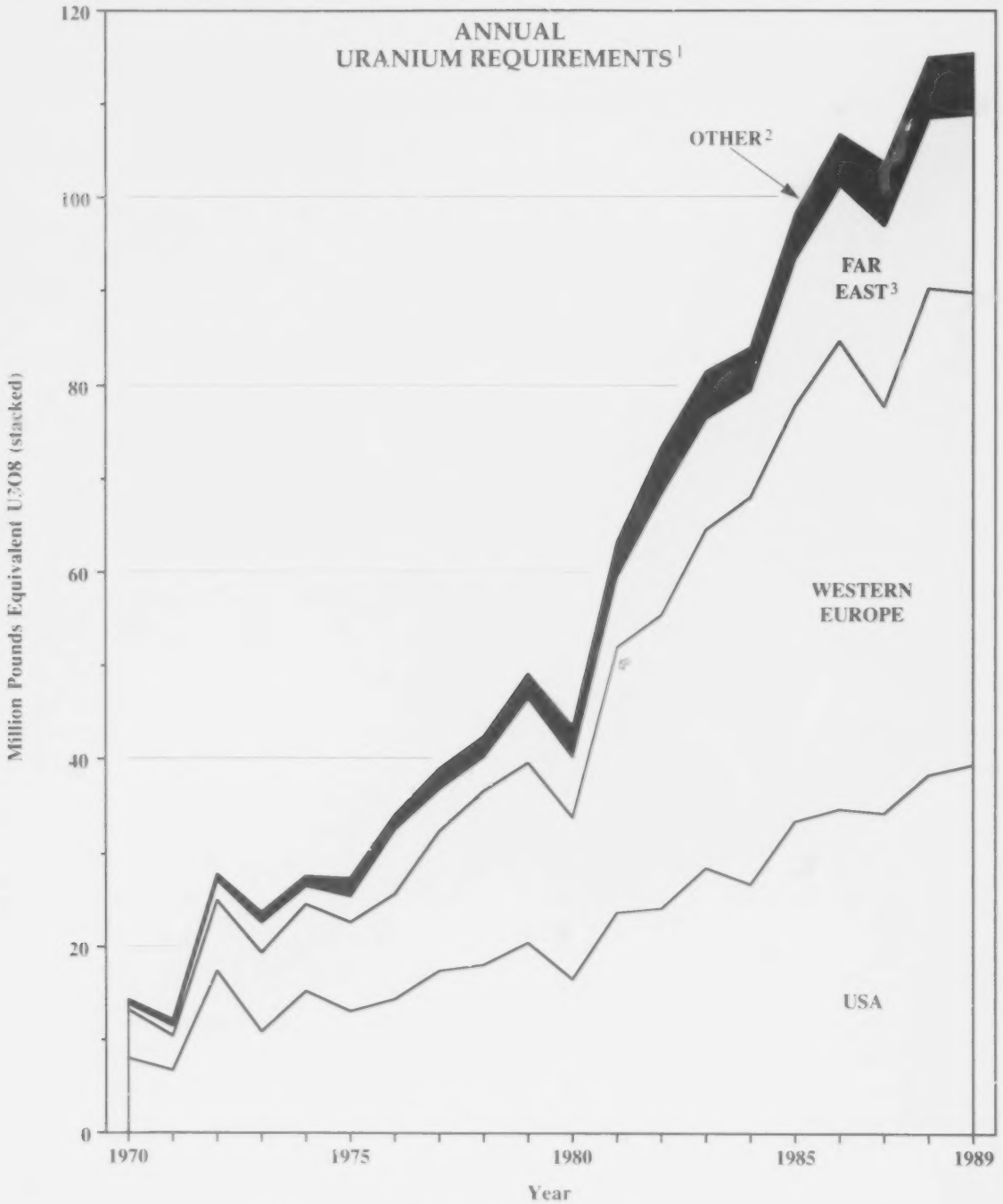
HISTORICAL MARKET DATA



[1] Calculated by NUEXCO based on actual completion dates and operating performance, and NUEXCO's estimate of enriching tails assays.

[2] **Other** include. Argentina, Brazil, Canada, India, Mexico, Pakistan and South Africa.

[3] Does not include Peoples Republic of China.

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Australia

Year	Period[1]	Consumer Price Index[2] (1980/1981 = 100)	Price Index of Materials Used in Manufacturing Industry — All Groups[3] (1984/1985 = 100)	Average Weekly Ordinary Time Earnings — Adult Males — Australia[4] (Australian dollars)	Award Rates of Pay Indexes Australia - Adult Males In Mining Wage Earners, Weekly Rates[5] (June 1985=100)
1980	Avg	95.8	83.1	—	140.8[6]
1981	Avg	105.0	85.9	—	154.1[6]
1982	Avg.	116.7	89.0	—	174.9[6]
1983	Avg.	128.5	96.9	—	181.9[6]
1984	Avg.	133.6	98.0	—	194.4[6]
1985	Avg.	142.6	107.3	—	103.7
1986	Avg.	155.5	101.5	—	106.1
1987	Avg.	168.7	108.9	465.88	112.3
1988	Avg.	180.9	111.8	496.90	115.2
1989	Avg.	194.6	117.0	534.65	126.0
1990	Avg.	208.7	123.4	571.43	129.6
Jan	1990	—	119.2	—	128.3
Feb	1990	—	120.8	555.80	128.3
Mar	1990	204.1	121.5	—	128.7
Apr	1990	—	119.9	—	129.0
May	1990	—	118.9	566.60	129.2
June	1990	207.4	116.6	—	129.8
July	1990	—	116.4	—	129.9
Aug	1990	—	122.4	574.10	130.0
Sept	1990	208.9	128.2	—	130.2
Oct	1990	—	134.1	—	130.4
Nov	1990	—	133.7	589.20	130.4
Dec	1990	214.5	128.8	—	130.6
Jan	1991	—	125.6	—	130.6
Feb	1991	—	121.5	—	130.5
Mar	1991	214.1	119.1	—	130.7R
Apr	1991	—	117.6	—	130.9R
May	1991	—	117.8	—	130.9R
June	1991	214.4	120.4	—	130.9

P = Preliminary **R** = Revised since last month

[1] Monthly data for the period 1967 to 1986 appears in Report 233 (January 1988).
[2] Weighted average of six State capital cities (1975 to 1980), and eight capital cities from 1981 (Base: Financial year July 1980 to June 1981 = 100.0). Figures shown at end of quarter represent quarterly average.
[3] Australian Bureau of Statistics, Canberra: "Price Index of Materials Used in Manufacturing Industry" (Catalogue No. 6411.0).
[4] Australian Bureau of Statistics, Canberra: "Award Rates of Pay Indexes, Australia" (Catalogue No. 6312.0). Figures for the latest fourteen months shown are subject to revision.
[5] Australian Bureau of Statistics, Canberra: "Average Weekly Earnings, States & Australia" (Catalogue No. 6302.0).
[6] Base: June 1976 = 100.

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GOVERNMENT STATISTICS

Canada

		Industrial Products Price Index: All Commodities [1] (1986 = 100) [2]	Consumer Price Index: All Items (1986 = 100) [3]	Wage-earner Data: Average Hourly Earnings (C$) [4]				
				Uranium Mines (SIC 057)	Metal Mines (SIC 051-059)	Mines, Quarries and Oil Wells (SIC 051-099)	Metal Rolling, Casting and Extruding (SIC 298)	Chemicals and Chemical Products Industries (SIC 372-379)
1980	Avg.	75.7	67.1	–.–	–.–	–.–	–.–	–.–
1981	Avg.	83.4	75.5	–.–	–.–	–.–	–.–	–.–
1982	Avg.	89.0	83.7	–.–	–.–	–.–	–.–	–.–
1983	Avg.	92.1	88.5	17.22	–.–	14.18	10.67	11.10
1984	Avg.	96.3	92.3	17.89	–.–	14.97	11.11	11.68
1985	Avg.	99.0	96.0	18.53	16.48	15.56	11.85	12.12
1986	Avg.	100.0	100.0	19.38	16.70	15.76	12.28	12.58
1987	Avg.	102.4	104.4	20.12	17.15	16.11	12.58	13.20
1988	Avg.	106.9	108.6	20.91	18.51	16.95	13.17	13.77
1989	Avg.	109.4	114.0	21.97	20.02	18.41	13.71	14.16
1990	Avg.	109.7	119.4	22.90	20.93	19.12	14.62	15.28
Jan	1990	108.7	116.9	21.88	20.39	19.03	13.99	14.78
Feb	1990	109.5	117.6	22.51	20.63	19.14	14.49	15.03
Mar	1990	109.3	118.0	22.52	20.75	19.17	14.99	15.07
Apr	1990	109.1	118.1	23.17	21.20	19.46	14.83	14.93
May	1990	109.6	118.7	23.28	20.55	19.01	14.71	15.06
June	1990	109.4	119.2	21.85	20.63	18.96	14.69	15.05
July	1990	109.1	119.8	20.92	20.18	18.66	14.34	15.20
Aug	1990	109.3	119.8	23.88	20.51	18.59	14.50	15.33
Sept	1990	110.2	120.2	24.41	21.19	18.94	14.48	15.63
Oct	1990	110.6	121.2	23.11	21.39	19.12	14.78	15.59
Nov	1990	110.9	121.9	23.38	21.83	19.48	14.93	15.73
Dec	1990	111.0	121.8	23.90	21.89	19.88	14.7	16.01
Jan	1991	111.1	125.0	23.79	21.79	19.78	14.66	15.89
Feb	1991	110.6 R	125.0	25.23	22.45	20.13	14.63	16.10
Mar	1991	109.8	125.5	24.19	22.22	20.27	15.21	16.47
Apr	1991	109.1	125.5	24.77	22.50	20.31	14.63	16.64
May	1991	108.6 R	126.1	24.38 R	22.17 R	20.25 R	15.05 R	16.55 R
June	1991	108.5 R	126.7	23.58 P	22.13 P	19.90 P	14.65 P	16.51 P
July	1991	108.2	126.8	–.–	–.–	–.–	–.–	–.–

P = Preliminary **R** = Revised since last month

[1] Statistics Canada, Prices Division, Ottawa: "Industry Price Indexes" (Catalogue 62-011). Indexes for the most recent six months shown are subject to revision. This category was formerly known as "Manufa... ring." Monthly data for the period 1967 to 1986 is found in Report 233.

[2] New Base Year of 1986 as of Report 266. Previous Base Year was 1981. All figures in column recalculated by 0.791 multiplier.

[3] New Base Year of 1986 as of Report 264. Previous Base Year was 1981. All figures in column recalculated by 0.755 multiplier.

[4] Statistics Canada, Labour Division, Employment and Payrolls Section, Ottawa: "Employment, Earnings and Hours." Monthly data for the period 1983 to 1986 is found in Report 233.

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South Africa

		Average Declared Working Costs per Metric Ton of Gold Ore Milled [1] (Rand)	Tonnage-Weighted Index of Average Working Costs per Metric Ton of Gold Ore Milled [2] (March 1982 = 100)	Consumer Price Index [3] (1985 = 100)	Production Price Index All Groups [4] (1985 = 100)	Total Employment in Mining and Quarrying [5]	Total Salaries and Wages in Mining and Quarrying [5] (1,000 Rand)
							Annual Total [6]
1980	Avg.	35.53	—	51.9	55.2	709,042	2,237,689
1981	Avg.	41.89	—	59.8	62.7	722,918	2,756,928
1982	Avg.	47.25	104.2	68.6	71.4	702,041	3,181,584
1983	Avg.	51.88	115.0	77.1	79.0	700,901	3,563,282
1984	Avg.	58.95	130.3	86.0	85.6	711,511	4,134,390
1985	Avg.	68.76	151.6	100.0	100.0	724,587	4,778,612
1986	Avg.	80.22	177.9	118.6	119.5	756,637	5,767,950
1987	Avg.	95.01	223.1	137.7	136.2	751,864	6,911,395
1988	Avg.	106.69	241.1	155.4	154.1	705,355	7,774,054
1989	Avg.	116.65	273.0	178.2	177.5	700,360	8,833,934
1990	Avg.	129.37	305.3	203.8	199.4	677,742	10,193,209
							Monthly Total
Jan	1990	—	—	192.0	188.8	688,837	801,616
Feb	1990	—	—	193.3	190.3	674,026	767,274
Mar	1990	126.74	296.3	196.4	190.9	704,660	780,614
Apr	1990	—	—	198.3	194.1	696,107	810,474
May	1990	—	—	200.4	196.3	613,527	719,191
June	1990	128.25	299.87	201.8	197.0	676,621	841,165
July	1990	—	—	203.2	197.2	697,242	913,177
Aug	1990	—	—	206.5	199.8	686,385	902,392
Sept	1990	129.46	312.55	209.7	203.2	689,317	922,454
Oct	1990	—	—	211.1	206.1	676,833	882,603
Nov	1990	—	—	215.6	214.9	669,198	909,418
Dec	1990	133.02	312.37	217.1	214.7	660,151	942,831
Jan	1991	—	—	219.5	216.1 R	648,944	935,839
Feb	1991	—	—	222.2	216.9 R	650,948	893,373
Mar	1991	137.66	323.82	224.1	215.3 R	640,039	905,490
Apr	1991	—	—	227.3	216.5 R	636,295	882,106
May	1991	—	—	230.8	218.4 R	—	—
June	1991	134.65	317.23	232.4	—	—	—
July	1991	—	—	235.3	—	—	—

P = Preliminary **R** = Revised since last month

[1] Chamber of Mines of South Africa, Johannesburg: "Analysis of Working Results," published quarterly. Historical Data by month appears in Report 236.

[2] Page 16 of Report 178 contains description and calculation of index, and page 24 of Report 178 lists figures for 1982.

[3] Central Statistical Service, Pretoria: All income groups-weighted average. Historical Data by month appears in Report 236.

[4] Central Statistical Service, Pretoria: All commodities for consumption in South Africa.

[5] Central Statistical Service, Pretoria: Historical Data by month appears in Report 236.

[6] Annual total is shown, rather than monthly average, for indicated year.

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GOVERNMENT STATISTICS

United States

		Producer Price Index[1]		Consumer Price Index[2]	GNP Implicit Price Deflator[3]	Gross Average Hourly Earnings of Production or Non-supervisory Workers (US$)[4]			
		Industrial Commodities (1982 = 100)	All Commodities (1982 = 100)	(1982-1984 = 100)	(1982 = 100)	Metal Mining (SIC 10)	Primary Non-ferrous Metals (SIC 333)	Chemicals and Allied Products (SIC 28)	Electric and Electronic Equipment (SIC 36)
1980	Avg.	88.0	89.8	82.4	85.7	10.26	10.63	8.30	6.94
1981	Avg.	97.4	98.0	90.9	94.0	11.55	11.98	9.12	7.62
1982	Avg.	100.0	100.0	96.5	100.0	12.31	12.93	9.96	8.21
1983	Avg.	101.1	101.3	99.6	103.9	12.58	13.43	10.58	8.67
1984	Avg.	103.3	103.7	103.9	107.7	13.05	13.43	11.07	9.04
1985	Avg.	103.7	103.2	107.6	110.9	13.38	13.74	11.56	9.46
1986	Avg.	100.0	100.2	109.6	113.9	12.46	13.48	11.98	9.65
1987	Avg.	102.6	102.8	113.6	117.7	12.52	12.98	12.37	9.88
1988	Avg.	106.3	106.9	118.3	121.3	13.24	13.26	12.71	9.79
1989	Avg.	111.6	112.2	124.0	126.3	13.59	13.72	13.09	10.05
1990	Avg.	115.8	116.3	130.7	131.5	14.10	14.36	13.54	10.37
Jan	1990	114.1	114.9	127.4	—	13.69	13.95	13.34	10.13
Feb	1990	113.6	114.4	128.0	—	13.70	13.99	13.27	10.16
Mar	1990	113.2	114.2	128.7	129.5	13.80	14.04	13.34	10.17
Apr	1990	113.2	114.1	128.9	—	13.92	14.30	13.53	10.17
May	1990	113.5	114.6	129.2	—	13.96	14.16	13.46	10.22
June	1990	113.2	114.3	129.9	131.0	14.00	14.31	13.51	10.27
July	1990	113.4	114.5	130.4	—	14.29	14.49	13.58	10.34
Aug	1990	115.9	116.5	131.6	—	14.27	14.60	13.57	10.33
Sept	1990	118.4	118.4	132.7	132.2	14.41	14.48	13.62	10.42
Oct	1990	121.4	120.8	133.5	—	14.43	14.58	13.72	10.47
Nov	1990	120.7	120.1	133.8	—	14.34	14.73	13.73	10.53
Dec	1990	119.0	118.7	133.8	133.1	14.39	14.69	13.75	10.57
Jan	1991	119.3	119.0	134.6	—	14.73	14.63	13.85	10.60
Feb	1991	117.2	117.2	134.8	—	14.80	14.55	13.81	10.59
Mar	1991	115.6	116.1	135.0	134.8	14.93	14.55	13.85	10.55
Apr	1991	115.5	116.0	135.2	—	14.85	14.56	13.96	10.63
May	1991	116.1	116.5	135.6	—	14.79	14.52R	14.01R	10.66R
June	1991	116.0	116.3	136.0	136.1	14.93P	14.52P	14.06R	10.74R
July	1991	—	—	136.2	—	—.—	—.—	14.23P	10.79P

P = Preliminary R = Revised since last month

[1] US Bureau of Labor Statistics, Washington, DC: "Producer Prices and Price Indexes," (formerly "Wholesale Prices and Price Indexes"). Producer Price Indexes are revised four months after they are first released to reflect the availability of late reports and corrections by respondents. Historical data is presented in Report 233.

[2] US Bureau of Labor Statistics, Washington, DC: Consumer Price Index for All Urban Consumers, US City Average, All Items. Historical data is presented in Report 233.

[3] US Department of Commerce, Washington, DC: Bureau of Economic Analysis, National Income and Wealth Division: "Survey of Current Business." The GNP Implicit Price Deflator is published quarterly, and seasonally adjusted. Historical data is presented in Report 233.

[4] US Bureau of Labor Statistics, Washington, DC: "Employment and Earnings." All data based on 1972 revision of SIC Manual. Historical data is presented in Report 233.

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US Uranium Marketing Activities Statistics

— Compiled from data published by the US Energy Information Administration [1] —

Year	Total Production (million pounds U_3O_8)	Deliveries to Domestic Utilities From US Suppliers [2] (million pounds U_3O_8)	Average Price of Delivered Uranium [2] ($/lb. U_3O_8)	Quantity of Uranium Imported [3] (million pounds U_3O_8)	Average Price of Imported Uranium ($/lb. U_3O_8)	Quantity of Uranium Exported (million pounds U_3O_8)
1976	25.5	27.6	$16.10	3.6	n/a	1.2
1977	29.9	27.8	$19.75	5.6	n/a	4.0
1978	37.0	31.6	$21.60	5.2	n/a	6.8
1979	37.5	33.0	$23.85	3.0	n/a	6.2
1980	43.7	35.0	$28.15	3.6	$43.10	5.8
1981	38.5	32.6	$34.65	6.6	$32.90	4.4
1982	26.9	23.5	$38.37	17.1	$25.19	6.2
1983	21.2	24.2	$38.21	8.2	$26.16	3.3
1984	14.9	22.5	$32.65	12.5	$21.86	2.2
1985	11.3	21.7	$31.43	11.7	$20.08	5.3
1986	13.5	18.9	$30.01	13.5	$20.07	1.6
1987	13.0	20.8	$27.37	15.1	$19.14	1.0
1988	13.1	17.6	$26.15	15.8	$19.03	3.3
1989	13.8	18.4	$19.56	13.1	$16.75	2.1

P = Preliminary **R** = Revised since last month

[1] Sources: 1976-1983: US Department of Energy/Energy Information Administration, *Survey of United States Marketing Activity*.
1984-1989: Energy Information Administration, *Uranium Industry Annual*.

[2] Data for 1976-1981 includes both domestic utilities and agents.

[3] Includes imports by domestic utilities and domestic suppliers.

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GOVERNMENT STATISTICS

Volume and Price of Uranium Deliveries To The European Community [1]

— Compiled from data published by the Euratom Supply Agency —

Year	Volume of Deliveries to the EC [2] (MTU)	Percentage of Deliveries Made Under Spot Contracts	Medium or Long-Term Contracts [3] Average Price		Spot Contracts [3] Average Price	
			in ECU per pound U_3O_8	in US Dollars per pound U_3O_8	in ECU per pound U_3O_8	in US Dollars per pound U_3O_8
1977	n/a	n/a	n/a	n/a	n/a	$41.00
1978	n/a	n/a	n/a	n/a	n/a	$43.00
1979	10,000	n/a	n/a	n/a	n/a	$44.50
1980	8,600	n/a	n/a	$36.00	n/a	$35.00
1981	13,000	less than 10	n/a	$33.25	n/a	$28.00
1982	12,500	less than 10	ECU 32.25	$32.00	ECU 24.25	$24.00
1983	13,500	less than 10	ECU 34.75	$31.00	ECU 26.00	$23.25
1984	11,000	less than 10	ECU 37.75	$29.75	ECU 24.50	$19.25
1985	11,000	11.5	ECU 38.00	$29.00	ECU 19.50	$15.00
1986	12,000	9.5	ECU 31.50	$31.00	ECU 18.00	$17.75
1987	14,000	17.0	ECU 28.25	$32.50	ECU 15.00	$17.25
1988	12,500	4.5	ECU 26.92	$31.82	ECU 13.65	$16.13
1989	13,500	11.5	ECU 26.63	$29.35	ECU 11.04	$12.19
1990	12,800	16.7	ECU 23.08	$29.39	ECU 7.60	$ 9.68

P = Preliminary **R** = Revised since last month

[1] The twelve European Community member nations are Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Luxembourg, The Netherlands, Portugal, Spain, and the United Kingdom; prior to January 1986, Spain and Portugal were not members of the EEC.

[2] The only deliveries taken into account are those made to final users, namely the electric utilities or their procurement organizations; deliveries to middlemen or fuel cycle companies are not included. The sales between utilities in the Community are also excluded. The quantities covered are those which were entered into accounting records during the year stated.

[3] For deliveries made under medium or long-term contracts (i.e., for which the time between the date of signature and the date of the last delivery exceeds one year) the prices were expressed in seven different currencies. In order to calculate an average price, these prices have been converted into European Currency Units (ECU) and US dollars. The average prices were weighted by quantity and converted on the basis of the average annual exchange rate of the different currencies against the ECU and US dollar. Exchange rates are published by European Communities Statistical Office and the International Monetary Fund.

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